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MEMOIR No. 1

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PHANEROGAMIC FLORA

OF THE DIVISIONS OF

UITENHAGE and PORT ELIZABETH

(With a Sketch Map)

BY S. SCHONLAND.

Contribution from the Herbarium of the Albany Museum,
Grahamstown.

PRETORIA
THE GOVERNMENT PRINTING AND STATIONERY OFFICE
1919

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Division of Botany,
Pretoria,
5th May, 1919.

Sir,

I have the honour to transmit herewith for publication the manuscript of a valuable paper by Prof. S. Schonland, of Rhodes University, Grahamstown, entitled: "On the Phanerogamic Flora of the Divisions of Uitenhage and Port Elizabeth," and I beg to recommend that the paper be printed as No. 1 of "The Memoirs of the Botanical Survey of South Africa."

Apart from the useful data given relating to the systematic components of the flora and its distribution in the divisions of Uitenhage and Port Elizabeth, Dr. Schonland's paper supplies valuable information regarding an area which comprises an important phytogeographical boundary and with respect to which more exact details have long been wanting.

I have the honour to be,
Sir,
Your obedient Servant,

I. B. POLE EVANS,
Director, Botanical Survey of S.A.

To the Secretary for Agriculture,
Department of Agriculture,
Pretoria.

PREFACE.

THE present Memoir, the first of the "Memoirs of the Botanical Survey of South Africa," is published as the outcome of the Government's decision to establish a Botanical Survey of the Union; an undertaking which had long been advocated and urged by officers of this Department and more recently had also been recommended by the Scientific and Technical Committee.

In July, 1918, an Advisory Committee for the Botanical Survey of the Union was appointed by the Minister for Agriculture, consisting of botanists from each of the four Provinces, with the Chief of the Division of Botany and Plant Pathology as Director of the Survey. The botanists comprising the Advisory Committee are also each in charge of different administrative areas into which the Union has been divided for purposes of the Survey. These officers, it should be mentioned, are not Government officials, but include the most experienced botanists in the country, and who, as soon as the Survey was mooted, came forward and offered their services gratuitously and solely from their keen desire to further botanical research in South Africa.

Such co-operation on the part of private workers with a Government Department is most encouraging and augurs well for the future of the Survey. It must, however, be borne in mind that the time of these private workers is strictly limited, and progress at first in such an important and vast undertaking must necessarily be slow.

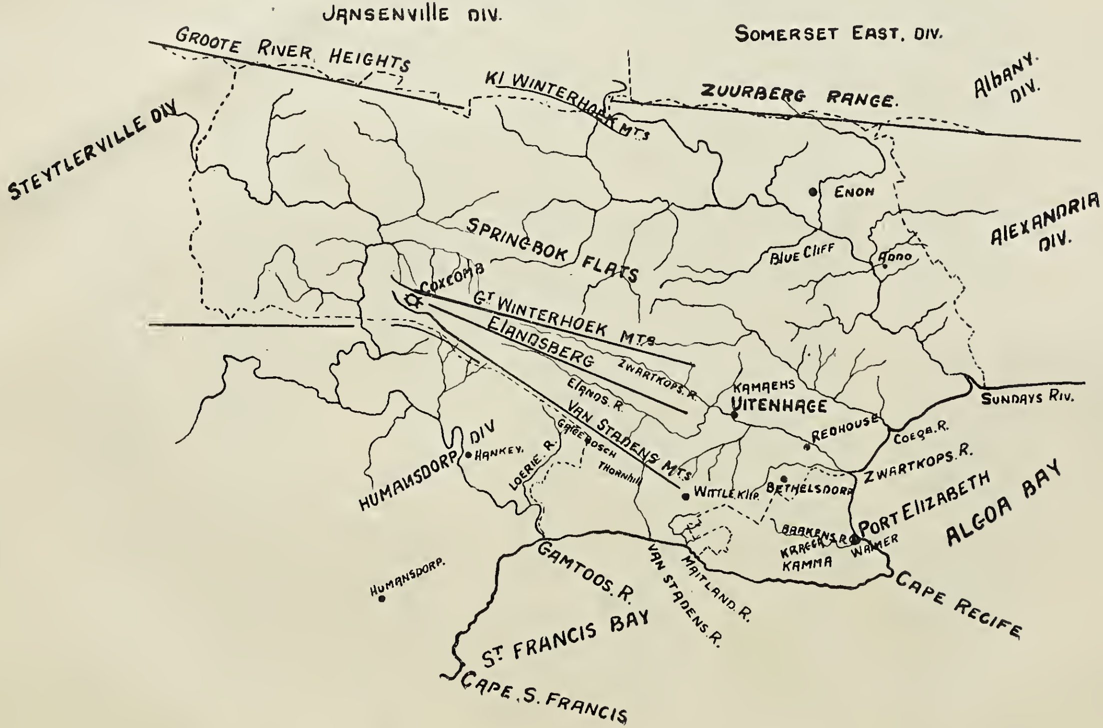
However, as time proceeds and as soon as the foundations are securely laid it is hoped that whole-time officers will be appointed in the different areas who will at first work under the direction of their more experienced colleagues, and will then later on become proficient and render valuable service on the Survey.

At the first meeting of the Advisory Committee, which was held in Pretoria in July, 1918, to discuss the aims and scope of the Survey, its organization and the best means of carrying it out, amongst other things it was unanimously agreed that as a basis of the Survey the preparation of regional floras should be taken in hand and local vegetation surveys prepared, and that these should be published as "Memoirs of the Botanical Survey of South Africa."

Dr. Schonland's valuable paper on "The Phanerogamic Flora of the divisions of Uitenhage and Port Elizabeth" thus forms the first of these regional floras to be published under the aegis of the Botanical Survey.

F. B. SMITH,
Secretary for Agriculture.

SKETCH MAP OF THE DIVISIONS OF UITENHAGE AND PORT ELIZABETH.



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INTRODUCTION.

The account of the flowering plants of the divisions of Port Elizabeth and Uitenhage herewith presented is meant to form a companion to the lists, published by the South African Philosophical Society and the Royal Society of South Africa, of the plants of the Cape Peninsula (by Bolus and Wolley Dod) and of Natal (by J. Medley Wood). It is based to a certain extent on a large number of publications, amongst which the "Flora Capensis," started by Harvey and Sonder and continued at Kew by various botanists, of course takes first place, but, wherever possible, the records are based on the specimens in the herbarium of the Albany Museum collected by Ecklon and Zeyher, the late Dr. P. MacOwan, the late Dr. H. Bolus, Dr. R. Schlechter, Mr. J. L. Drege, Mr. W. C. Kemsley, Mr. F. H. Holland, Ven. Archdeacon Rogers, etc., but especially by Mrs. T. V. Paterson, of Redhouse, who has inherited from her father, the late Mr. Russell Hallack, an ardent love of the flora of her native country, and who has for a number of years indefatigably laboured in the exploration not only of the divisions of Uitenhage and Port Elizabeth, but also of other parts of South Africa which she has visited. Thus references from the literature were only entered if they added to our knowledge of the local distribution of the plants or if they referred to plants not again collected recently. Miss A. Daly and Miss J. Gane (now Mrs. Williamson) excerpted the greater part of the references in the "Flora Capensis." Much of the material received during recent years was provisionally determined by Miss M. Daly (now Mrs. Heny) and Miss J. Gane, but the whole material in the collection of the Albany Museum (with the exceptions noted later) was eventually revised by myself with the aid of Miss Gane. The greater part of the list was submitted in sections to Mrs. F. Bolus, who added data from the Bolus Herbarium, but it would have been very incomplete and to a certain extent faulty if Mrs. Bolus had further not had the kindness to determine a great many species which could not be accurately named with the resources of the Albany Museum. To her husband, Mr. F. Bolus, I am indebted for a critical revision of Gladiolus, Oxalis, and many grasses. I have also frequently received help from Sir David Prain, F.R.S., Director of Kew Gardens, and the members of his staff, which I wish to gratefully acknowledge.

Probably Thunberg was the first botanist who visited our area (in the year 1773). In his "Flora Capensis" (ed. Schultes, 1823) there are a number of references to plants collected on the Zwartkops River and at the Zwartkops Saltpan; Andreas Sparmann followed in 1776; Lichtenstein between 1803 and 1806. Burchell passed through it in 1814 and gives a careful record of his route on the map attached to the first volume of his "Travels in Southern Africa." His extensive collections are to this day not fully worked up or at all events only partly published. J. F. Drege traversed it during his travels in 1826–34, but does not seem to have collected as extensively here as in other parts of South Africa. The richest collections were made by Ecklon and Zeyher. The latter was for some years domiciled at Uitenhage whence he started on his famous trip to the Magaliesberg with Burke, who also collected near Uitenhage. Ecklon published " A list of the plants found in the district of Uitenhage between the months of July, 1829, and February, 1830, together with a description of some new species " (*S.A. Quart. Journ.*, 1830). I have made but little use of this list, since most of Ecklon's collections have been utilized in more recent monographic publications which I have consulted. Many of his names are moreover undoubtedly incorrect, which is only to be expected considering the circumstances under which he worked, though it is not always possible to judge him correctly. Further, both he and Zeyher were rather inclined to split up species much more than I am inclined to admit as justified. This was also the view of Harvey, Sonder, and other botanists. However, he was a keen and careful observer, and his paper will always demand respectful attention, which it has not always received, no doubt owing to its extreme scarcity.

Minor collections were made by Dr. Alexander Prior (who discovered *Sterculia Alexandri*), Ch. F. Bunbury (in 1838), and A. Krauss (about 1840). Bunbury gave some account of his travels in *Hook. Journal of Botany*, 1842–44, and in his " Journal of a residence at the Cape of Good Hope," which contains some graphic descriptions of the flora of our area. Dr. N. Wallich, so well known on account of his work on the flora of India, visited Uitenhage in 1843.

There was a gap of over thirty years before serious attention was again given to these parts. At the end of 1866 MacOwan and Bolus made a joint collecting trip from Grahamstown to Van Stadens, which lasted into January, 1867. Many of the species previously discovered were found again and others were newly discovered. Both visited the districts again in subsequent years. I myself have visited the two divisions frequently, but have not collected many plants in them. Large parts, especially the northern and north-western portions of the division of Uitenhage, are very little explored. Most of the stations from which we have records are in an area of about 600 square miles, while the total area is about 2500 square miles. Even taking the former only into consideration the flora cannot compare in richness with that of the Cape Peninsula, which only covers 197½ square miles, while it is relatively much richer than Natal with an area of 21,150 square miles.

TOPOGRAPHY.

The area under consideration is bounded in the south by the Indian Ocean. It is, therefore, under the influence of the warm Mozambique current. Algoa Bay marks the place where the southern coast of South Africa assumes a north-eastern direction. The western boundary of the coastline is marked by the Gamtoos River, the eastern by the mouth of the Sundays River. In the north it is bounded by the Klein Winterhoek Mountains and the Zuurberg Range. It will thus be seen that it extends approximately fifty miles inland. Most of the localities mentioned in the enumeration of plants lie between two lines almost due north of the mouths of the two rivers mentioned. Some plants mentioned from the Zuurberg and near Addo may have been collected in the adjoining Alexandria district, which, however, is not separated by a phytogeographical boundary. The boundary between the divisions of Port

Elizabeth and Uitenhage need not concern us. From our point of view it is quite artificial. It has, however, been marked on the accompanying sketch-map, on which a number of the localities where specimens were collected were entered.

South of the Little Winterhoek are the Great Winterhoek Mountains, which in their western part, the Coxcomb, rise to an altitude of nearly 5000 feet. Towards the Coxcomb two other mountain ranges, the Elandsberg and the Van Stadens Mountains, with an eastern spur, the Witteklip, converge. The last comes to within about twenty miles from the sea and about twenty miles from Port Elizabeth. The altitude I judge to be about 2000 feet. The Great Winterhoek Mountains are continued eastwards by hills north of Uitenhage, the Addo heights being in the line of this continuation. South of the Van Stadens Mountains is a plateau of an altitude of about 700 feet, traversed by the Van Stadens River. East of it there is a similar plateau continuous with the former and ending somewhat abruptly in the Bethelsdorp hills. Towards Walmer and Port Elizabeth it diminishes gradually in altitude. It drops more or less abruptly to near sea-level within a variable but never considerable distance from the sea. North of Port Elizabeth is the mouth of the Zwartkops River, which takes its rise in the Great Winterhoek Mountains and is fed by the Elands River. East of it are the Zwartkops hills of an altitude of about 300 feet, forming the western boundary of another plateau. Between the Zwartkops and Sundays River mouths is the mouth of the Coega River, which arises on the eastern parts of the Great Winterhoek Mountains. Near this mouth is the Coega Kop. A feature of some importance is the plain on both banks of the Zwartkops River to a little beyond Zwartkops station and on its right bank to the neighbourhood of Uitenhage. In its lower parts it is frequently to a certain extent inundated at high tides. This plain is meant when, in connection with Ecklon and Zeyher plants, "fields by the Zwartkops River" have been mentioned as localities by them and subsequent authors. This term is somewhat misleading, as to this day only comparatively small patches are cultivated. North of the Great Winterhoek Mountains are the extensive Springbok Flats. The north-eastern part of the Uitenhage Division is rather hilly.

Apart from a few saltpans not far from the sea there are no large natural stretches of standing water. The upper reaches of the rivers have, however, a fair number of pools which contain water even if the rivers have otherwise run dry as happens only too frequently. All mountain ranges exhibit magnificent kloofs, of which the one traversed by the Van Stadens Pass, and the one leading to the "Hells Gates" on the farm Kamaehs north of Uitenhage, are the most familiar to local residents.

A few altitudes in addition to those already given may help to make the topography clearer to the reader:

(*a*) Plateau south or south-east of Van Stadens Mountains. (The places mentioned are along the Avontuur–Port Elizabeth railway, except the two last): Gamtoos 23 feet, Loerie 108 feet, Summit 747 feet, Thornhill 724 feet, Van Stadens 816 feet, Witteklip 784 feet, Green Bushes 695 feet, Emerald Hill 262 feet, Valley Junction 191 feet, Humewood Road 62 feet, Kraggakamma 873 feet, Bethelsdorp 704 feet.

(*b*) Port Elizabeth–Graaff Reinet railway line: Port Elizabeth 13 feet, New Brighton 37 feet, Zwartkops 17 feet, Redhouse 28 feet, Despatch 85 feet, Uitenhage 169 feet, Sandfontein 490 feet, Bluecliff 405 feet, Glenconnor 722 feet. In the next eighteen miles the altitude rises to 1873 feet at Kleinpoort, and twenty miles further at Barroe it is 2257 feet. From the boundary of the Uitenhage Division to Graaff–Reinet, a distance of about eighty miles, it remains near this altitude.

(*c*) Port Elizabeth–Kimberley railway line [this joins (*b*) at Zwartkops]: Aloes 154 feet, Coega 36 feet, Tankatara 247 feet, Barkly Bridge (Sundays River) 48 feet, Addo 116 feet, Coerney 463 feet. A few miles north of Coerney the Zuurberg rises somewhat abruptly. The Zuurberg Sanatorium has an altitude of about 2200 feet, which is approximately the average altitude of the Zuurberg range. Enon, which is almost due west of Coerney, has an altitude of 350 feet.

GEOLOGY.

In broad outline the geological features of the two divisions are as follows:—The western part to a distance of about thirty miles inland belongs largely to the Table Mountain Series. Then comes a strip about ten miles in width belonging to the Bokkeveld Series, then a narrow strip belonging to the Uitenhage Series, and when we come to the Klein Winterhoek and Zuurberg we find the Witteberg Series. There is a large exposure of the Uitenhage beds at the mouth of the Gamtoos River and a small exposure of Malmesbury beds between the Gamtoos River mouth and Port Elizabeth. The plateau south and east of Van Stadens Mountains belongs to the Table Mountain Series, which thus reaches the Bethelsdorp hills and reappears again on the Coega Kop. The remainder of the divisions belong to the Uitenhage Series, with the exception of stretches of volcanic rocks near Enon. The Uitenhage Series is in many places overlaid by younger formations (Pleistocene ?), and especially along the Sundays River there are large stretches of deep alluvial soil, mostly derived from the Karroo beds north of the Uitenhage Division. No doubt the soil derived from these various formations stamps to a certain extent the character of the vegetation, and it is interesting to note that as far as Port Elizabeth no serious break in the continuity of geological formations from the west occurs, but, on the whole, it will be seen that here, as in other parts of South Africa, climate, especially rainfall, is the most important factor in the determination of the distribution of plants.

CLIMATE.

Winds.—In the consideration of phytogeographical problems only violent winds need to be taken into consideration as being of importance in the dispersal of seeds. During the summer violent south-easters are of frequent occurrence. Pure eastern, and especially north-easterly, winds are much rarer. In winter, on the other hand, strong westerly winds are frequent. Strong northerly winds are rare. Thus the we tern types of plants are favoured in their dispersal by the winds.

Temperature.—The data at my disposal are scanty. The following are abstracted from a paper by F. Beutler, " Die Temperaturverhaeltnisse des aussertropischen Suedafrika," Jena, 1906. They refer to three localities which are also dealt with in the rainfall returns. They form the corners of a triangle, the sides of which are roughly twenty miles in length.

	Van Stadens.	Port Elizabeth.	Uitenhage.	Van Stadens.	Port Elizabeth.	Uitenhage.
S. latitude...	33° 53′	33° 58′	33° 46′			
E. longitude.	25° 16′	25° 37′	25° 25′			
Altitude.....	1000′	200′	300′			
	Temperature in Degrees Centigrade.			Daily Average Temperature Latitude.		
Years.......	4	22	5½	4	22	5½
January.....	19·4	20·5	21·6	10·5	6·6	12·7
February....	20·6	20·8	22·0	11·3	6·6	13·2
March.......	20·1	19·6	20·7	12·4	7·0	12·6
April........	17·9	17·9	19·0	12·4	7·6	14·9
May.........	15·8	16·2	16·3	13·4	8·7	15·9
June........	13·4	15·0	13·9	13·0	9·3	16·0
July.........	13·6	14·0	13·5	13·3	9·8	17·4
August......	13·7	14·4	14·9	12·2	8·7	16·9
September...	14·3	15·0	15·5	11·7	7·5	14·2
October......	15·4	15·2	17·1	11·3	6·9	13·4
November...	16·5	17·6	18·6	11·2	7·0	12·9
December....	18·8	19·3	20·5	11·8	6·9	13·5
Year........	16·6	17·2	17·8	12·0	7·7	14·5
Difference between summer and winter...	7·2	6·8	8·5			

It will be seen that Port Elizabeth has more even temperatures than Van Stadens and Uitenhage, that the summer temperature of Uitenhage is greater than that of either of the others, and that Van Stadens has lower winter temperatures than the others. The daily difference between maximum and minimum temperature is greater in Uitenhage than at Van Stadens and very much greater than at Port Elizabeth, warm days being frequently followed by cold nights, reminding us of the Karroo climate. In the north-eastern parts of the Uitenhage Division the contrasts are not so striking, as I know from personal experience, but no records are available. Frost is of frequent occurrence in winter nights at Uitenhage, but Port Elizabeth is free from it, though the greater part of the two towns have altitudes with so little difference that it need hardly be taken into consideration. According to Bolus (" Science in South Africa," 1905, p. 209), at Van Stadens in five years the minimum temperature was 0° C., the maximum 40·8° C.

Rainfall.—Continuous records over long periods are only available for the three stations, for which I have quoted temperature records. I have selected for purposes of illustration the monthly records of the years 1897-1916. For each month the number of days on which rain fell are also given. I am indebted for these data to Mr. W. Stewart, Chief Meterorologist of the Union Government, and the Town Engineer's Department, Port Elizabeth.

RECORDS OF RAINFALL for VAN STADENS (alt. 1000 ft.), PORT ELIZABETH (alt. 200 ft.), and UITENHAGE (alt. 300 ft.), together with the records of the number of days during which rain fell in each month.

FOR THE YEARS 1897 TO 1901.

		1897.		1898.		1899.		1900.		1901.	
		in.	d.	in.	d.	in.	d.	in.	d.	in.	d.
Jan.	Van Stadens....	0·83	6	6·29	13	1·99	11	1·97	7	1·51	5
	Port Elizabeth..	0·20	1	4·88	9	0·98	4	3·46	6	0·50	4
	Uitenhage.......	0·46	4	3·93	13	0·60	3	1·20	4	0·49	2
Feb.	Van Stadens....	1·78	8	2·09	9	1·67	7	1·28	7	3·61	13
	Port Elizabeth..	0·66	3	1·28	6	0·30	6	0·74	2	1·03	12
	Uitenhage.......	0·25	1	1·41	6	0·87	4	0·52	2	2·30	9
Mar.	Van Stadens....	3·00	9	0·78	9	1·18	9	2·14	7	2·89	11
	Port Elizabeth..	0·66	6	0·45	3	0·94	5	1·83	5	1·51	8
	Uitenhage.......	0·97	4	0·67	3	0·84	4	3·18	6	1·44	6
Apr.	Van Stadens....	0·50	4	1·09	5	3·63	10	0·55	5	3·56	9
	Port Elizabeth..	0·73	5	1·38	6	2·05	6	0·48	3	1·92	9
	Uitenhage.......	0·03	2	1·32	3	3·35	8	0·97	3	1·33	7
May	Van Stadens....	7·39	7	2·34	9	2·03	5	1·09	5	1·33	7
	Port Elizabeth..	7·96	8	1·88	7	0·89	4	1·50	3	1·77	9
	Uitenhage.......	3·37	8	0·21	2	1·02	6	0·86	2	0·18	2
June	Van Stadens....	3·78	6	0·86	3	1·93	5	0·93	5	2·82	5
	Port Elizabeth..	2·71	6	0·66	5	0·99	5	0·23	2	2·43	5
	Uitenhage.......	1·54	4	0·07	2	0·40	6	0·19	1	2·79	4
July	Van Stadens....	2·88	6	1·60	5	0·38	3	0·67	8	0·73	3
	Port Elizabeth..	1·98	3	1·99	4	0·20	2	0·63	8	2·41	6
	Uitenhage.......	0·59	2	0·60	4	0·18	3	0·32	3	0·05	1
Aug.	Van Stadens....	2·03	9	1·18	5	0·45	3	2·79	11	1·11	5
	Port Elizabeth..	1·24	8	0·21	2	0·52	6	2·51	8	1·00	5
	Uitenhage.......	1·37	6	0·37	2	0·35	4	0·97	6	0·77	2
Sept.	Van Stadens....	6·67	9	2·59	8	1·68	8	1·14	3	7·98	13
	Port Elizabeth..	5·46	8	2·91	5	0·96	10	0·95	5	3·29	14
	Uitenhage.......	5·04	8	0·52	4	0·91	6	0·05	1	4·45	10
Oct.	Van Stadens....	3·93	11	3·70	13	1·76	9	2·69	6	3·93	11
	Port Elizabeth..	1·98	6	3·99	11	0·83	5	0·98	6	1·57	9
	Uitenhage.......	4·02	11	2·64	8	0·58	4	2·09	3	1·00	5
Nov.	Van Stadens....	2·95	6	2·59	9	1·51	10	1·70	11	4·52	11
	Port Elizabeth..	2·27	8	1·19	7	0·98	5	0·89	7	2·51	7
	Uitenhage.......	2·00	3	1·40	6	0·25	1	0·31	2	3·29	9
Dec.	Van Stadens....	0·71	7	2·98	9	2·01	9	5·91	11	1·27	8
	Port Elizabeth..	0·38	5	1·53	10	0·77	6	3·22	9	0·44	5
	Uitenhage.......	0·29	1	1·09	4	0·92	5	5·70	11	0·25	2
Totals	Van Stadens....	36·45	88	28·09	97	20·22	89	22·86	86	35·26	101
	Port Elizabeth..	26·23	67	22·35	77	10·41	64	17·42	64	20·38	93
	Uitenhage.......	19·93	54	14·23	57	10·27	54	16·36	44	18·34	59

RECORDS OF RAINFALL for VAN STADENS (alt. 1000 ft.), PORT ELIZABETH (alt. 200 ft.), and UITENHAGE (alt. 300 ft.), together with the records of the number of days during which rain fell in each month.—(*contd.*)

FOR THE YEARS 1902 TO 1906.

		1902.		1903.		1904.		1905.		1906.	
		in.	d.	in.	d.	in.	d.	in.	d.	in.	d.
Jan.	Van Stadens....	1·09	3	0·59	7	0·88	6	0·85	5	0·28	2
	Port Elizabeth..	0·48	8	0·22	4	0·22	3	0·35	3	0·42	4
	Uitenhage.......	0·19	1	0·27	4	0·57	4	0·13	3	0·32	4
Feb.	Van Stadens....	1·17	6	1·84	9	4·42	13	3·93	10	3·44	15
	Port Elizabeth..	1·35	5	0·95	8	0·95	10	2·12	9	1·38	11
	Uitenhage.......	1·54	5	0·44	5	3·32	9	2·63	8	1·05	7
Mar.	Van Stadens....	5·40	11	2·05	6	1·91	9	3·45	4	2·33	11
	Port Elizabeth..	2·87	10	2·26	7	1·45	5	1·15	6	2·30	14
	Uitenhage.......	3·33	7	0·97	5	1·37	9	2·65	8	1·45	10
Apr.	Van Stadens....	0·88	6	1·87	8	0·18	2	1·98	6	5·46	8
	Port Elizabeth..	0·97	3	3·58	10	0·22	4	1·09	4	3·57	8
	Uitenhage.......	0·53	5	0·49	7	0·12	2	1·73	7	2·28	7
May	Van Stadens....	0·42	3	0·79	3	0·50	5	2·66	10	4·44	11
	Port Elizabeth..	0·53	5	0·45	2	1·40	6	1·77	10	4·64	11
	Uitenhage.......	0·51	5	1·20	3	0·14	2	1·88	8	2·59	10
June	Van Stadens....	2·03	5	2·96	6	0·46	2	3·63	6	2·43	4
	Port Elizabeth..	2·30	4	3·29	8	1·69	4	1·21	6	2·21	5
	Uitenhage.......	1·39	3	1·07	5	0·29	4	1·85	8	1·45	5
July	Van Stadens....	1·55	9	1·89	7	3·16	4	0·48	3	0·44	4
	Port Elizabeth..	1·62	8	1·38	7	2·41	7	1·27	6	1·81	5
	Uitenhage.......	0·70	6	1·16	4	1·01	3	0·18	4	0·25	4
Aug.	Van Stadens....	11·64	18	2·13	7	3·28	8	3·23	11	0·63	4
	Port Elizabeth..	4·68	18	2·13	9	4·51	7	3·69	12	0·26	5
	Uitenhage.......	7·51	13	0·93	5	2·71	6	1·13	8	0·30	3
Sept.	Van Stadens....	4·47	9	0·99	6	3·54	10	19·64	9	2·24	6
	Port Elizabeth..	1·68	8	0·35	4	1·69	8	7·71	13	2·85	10
	Uitenhage.......	3·46	8	0·18	2	1·82	8	11·21	10	2·23	5
Oct.	Van Stadens....	1·61	8	5·96	8	7·24	15	6·22	6	4·31	10
	Port Elizabeth..	1·02	7	3·35	13	4·78	11	2·43	5	2·78	13
	Uitenhage.......	0·93	8	2·69	9	2·86	10	3·35	6	2·16	9
Nov.	Van Stadens....	1·48	5	12·07	12	0·86	6	1·16	6	0·93	5
	Port Elizabeth..	1·66	9	7·23	15	1·37	8	0·55	3	1·23	9
	Uitenhage.......	1·43	5	5·90	10	0·46	3	0·29	2	1·23	7
Dec.	Van Stadens....	2·90	6	1·20	5	2·93	12	0·93	7	8·46	13
	Port Elizabeth..	0·93	5	0·74	5	1·26	7	0·86	6	5·70	11
	Uitenhage.......	2·02	7	0·57	5	2·19	7	0·70	5	5·56	9
Totals	Van Stadens....	34·64	89	34·34	85	29·36	92	48·16	83	35·39	93
	Port Elizabeth..	20·09	90	25·93	92	21·95	80	24·20	83	29·15	106
	Uitenhage.......	23·54	73	15·87	64	16·86	67	27·73	77	20·87	80

RECORDS OF RAINFALL for VAN STADENS (alt. 1000 ft.), PORT ELIZABETH (alt. 200 ft.), and UITENHAGE (alt. 300 ft.), together with the records of the number of days during which rain fell in each month.—(*contd.*)

FOR THE YEARS 1907 TO 1911.

		1907.		1908.		1909.		1910.		1911.	
		in.	d.	in.	d.	in.	d.	in.	d.	in.	d.
Jan.	Van Stadens....	0·73	4	2·20	3	3·16	9	0·73	4	5·22	10
	Port Elizabeth..	0·52	6	0·88	3	2·55	9	0·68	5	3·41	9
	Uitenhage.......	0·82	4	0·61	3	2·47	10	0·58	5	3·09	9
Feb.	Van Stadens....	1·08	5	0·83	2	1·39	7	5·72	12	2·42	11
	Port Elizabeth..	0·86	5	0·91	3	0·98	12	4·05	13	0·94	6
	Uitenhage.......	0·86	4	0·58	2	1·47	6	5·13	12	1·11	6
Mar.	Van Stadens....	3·43	8	2·14	8	1·60	4	4·69	11	3·71	6
	Port Elizabeth..	2·56	6	1·11	7	1·07	6	1·88	9	1·68	8
	Uitenhage.......	4·09	7	2·31	9	1·06	8	2·53	8	2·42	4
Apr.	Van Stadens....	3·17	11	7·92	5	1·96	7	0·60	2	1·87	5
	Port Elizabeth..	3·09	13	5·49	6	2·89	10	2·13	5	2·40	10
	Uitenhage.......	1·62	11	4·54	6	1·39	7	0·48	5	1·62	7
May	Van Stadens....	5·30	7	0·40	3	1·13	5	5·22	4	3·65	7
	Port Elizabeth..	4·85	11	0·31	2	0·55	10	3·58	4	2·50	10
	Uitenhage.......	2·38	8	0·20	3	1·21	7	3·42	6	1·56	6
June	Van Stadens....	0·35	3	1·88	6	0·05	1	1·40	6	4·67	4
	Port Elizabeth..	0·62	5	2·68	7	0·15	3	1·62	9	2·02	5
	Uitenhage.......	0·14	3	1·45	8	0·15	3	0·78	4	1·82	3
July	Van Stadens....	0·85	3	0·72	4	0·70	3	0·10	1	1·48	4
	Port Elizabeth..	0·54	4	2·28	6	1·43	5	0·82	2	2·12	4
	Uitenhage.......	0·18	2	0·62	6	0·23	3	0·15	5	0·95	4
Aug.	Van Stadens....	1·05	2	3·32	7	2·87	4	0·76	4	2·40	12
	Port Elizabeth..	0·74	5	2·36	9	3·16	7	3·54	5	3·55	12
	Uitenhage.......	0·16	3	0·87	7	1·59	7	0·59	4	1·28	8
Sept.	Van Stadens....	1·79	7	1·17	4	3·04	10	2·53	9	5·87	5
	Port Elizabeth..	0·65	7	0·80	4	2·17	12	1·30	7	7·59	7
	Uitenhage.......	0·44	5	1·16	4	1·44	8	0·61	6	5·83	6
Oct.	Van Stadens....	1·92	6	6·73	14	4·91	9	8·78	8	3·51	14
	Port Elizabeth..	2·79	10	3·58	13	2·84	12	4·28	8	1·72	10
	Uitenhage.......	0·53	7	4·37	13	1·26	8	2·46	6	1·85	10
Nov.	Van Stadens....	2·09	7	3·21	5	1·63	5	2·34	8	0·93	6
	Port Elizabeth..	1·22	11	4·49	8	1·70	6	0·96	8	0·25	6
	Uitenhage.......	1·04	10	3·58	4	0·78	5	1·47	8	0·62	6
Dec.	Van Stadens....	2·93	7	1·13	4	4·97	13	2·80	3	0·45	2
	Port Elizabeth..	2·96	9	0·76	8	2·57	12	0·50	8	0·64	5
	Uitenhage.....	2·48	8	0·70	7	2·99	10	1·52	5	0·24	2
Totals	Van Stadens....	24·69	70	31·65	65	27·41	77	33·67	72	36·18	86
	Port Elizabeth..	21·40	92	25·65	76	22·06	104	25·34	83	28·82	92
	Uitenhage.......	14·74	72	20·99	72	16·04	82	19·72	74	22·39	71

RECORDS OF RAINFALL for VAN STADENS (alt. 1000 ft.), PORT ELIZABETH (alt. 200 ft.), and UITENHAGE (alt. 300 ft.), together with the records of the number of days during which rain fell in each month.—(*contd.*)

FOR THE YEARS 1912 TO 1916.

		1912.		1913.		1914.		1915.		1916.	
		in.	d.	in.	d.	in.	d.	in.	d.	in.	d.
Jan.	Van Stadens....	4·74	7	0·90	6	2·80	6	2·19	9	1·86	8
	Port Elizabeth..	2·18	11	0·87	6	2·20	13	1·83	10	4·16	14
	Uitenhage.......	2·38	8	1·27	8	1·68	4	1·43	7	3·23	7
Feb.	Van Stadens....	1·58	10	1·90	7	1·47	9	0·65	4	0·00	0
	Port Elizabeth..	0·99	10	1·79	9	1·01	9	0·63	5	0·24	6
	Uitenhage.......	2·09	11	4·22	8	1·29	5	0·34	5	0·00	0
Mar.	Van Stadens....	1·62	8	2·80	9	1·05	5	1·01	7	3·95	9
	Port Elizabeth..	0·67	10	2·82	10	0·72	7	0·47	5	3·31	11
	Uitenhage.......	0·87	6	3·64	7	0·91	4	0·67	5	2·24	8
Apr.	Van Stadens....	5·53	4	1·96	7	3·77	5	3·81	7	1·92	7
	Port Elizabeth..	3·15	10	0·18	3	2·98	5	2·35	7	0·77	6
	Uitenhage.......	5·24	6	0·32	2	2·47	3	1·87	6	0·97	4
May	Van Stadens....	1·06	3	1·80	4	2·53	3	2·40	5	4·89	8
	Port Elizabeth..	1·52	5	2·05	6	1·63	5	1·54	8	7·70	9
	Uitenhage.......	0·53	4	1·22	3	2·38	1	1·17	6	2·99	7
June	Van Stadens....	3·23	7	0·12	1	1·88	5	1·41	6	0·62	2
	Port Elizabeth..	2·48	7	0·65	4	2·53	7	1·51	5	1·37	4
	Uitenhage.......	2·36	6	0·03	1	2·15	3	0·71	3	0·20	1
July	Van Stadens....	1·68	7	2·01	5	2·50	1	5·11	9	2·14	1
	Port Elizabeth..	1·85	6	1·43	6	1·39	3	4·69	12	1·57	4
	Uitenhage.......	0·58	4	0·88	3	1·69	3	2·17	7	1·10	2
Aug.	Van Stadens....	2·30	7	3·26	6	1·45	5	0·44	4	1·45	6
	Port Elizabeth..	2·62	6	3·98	8	1·78	10	0·82	7	1·66	6
	Uitenhage.......	1·00	4	1·73	2	1·09	8	0·58	6	0·60	5
Sept.	Van Stadens....	5·59	9	4·86	9	0·75	7	1·51	6	1·60	7
	Port Elizabeth..	3·45	12	5·19	10	1·71	9	2·46	10	1·63	7
	Uitenhage.......	1·91	5	3·46	7	0·00	0	0·43	4	1·66	9
Oct.	Van Stadens....	3·02	5	2·64	4	1·73	7	3·21	7	1·97	6
	Port Elizabeth..	1·08	7	1·95	6	2·29	9	2·58	9	1·19	9
	Uitenhage.......	1·90	4	1·50	1	1·92	8	2·12	7	0·08	2
Nov.	Van Stadens....	1·00	5	1·48	6	4·55	9	1·23	6	1·46	7
	Port Elizabeth..	0·84	6	1·35	9	2·07	7	1·51	8	1·31	8
	Uitenhage.......	0·37	2	0·65	4	2·42	6	0·74	3	1·10	6
Dec.	Van Stadens....	2·43	8	0·50	2	1·35	6	1·15	7	2·97	8
	Port Elizabeth..	1·47	6	0·83	6	0·32	5	2·57	10	1·63	7
	Uitenhage.......	1·21	5	0·00	0	0·55	2	1·54	10	1·32	5
Totals	Van Stadens....	33·78	80	24·23	66	25·83	68	24·12	77	24·83	69
	Port Elizabeth..	22·30	96	23·09	83	20·63	89	22·96	96	26·54	91
	Uitenhage.......	20·44	65	18·92	46	18·55	47	13·77	69	15·49	56

	Van Stadens.	Port Elizabeth.	Uitenhage.
Average yearly rainfall...........	30 ·55″	22 ·69″	18 ·25″
Average number of days on which rain fell during a year.........	82	86	68
Largest yearly rainfall...........	36 ·45″ (1897)	28 ·82″ (1910)	27 ·73″ (1905)
Lowest ,, ,, ...	20 ·22″ (1899)	10 ·41″ (1899)	10 ·27″ (1899)
Largest number of days on which rain fell in one year...........	101 (1901)	96 (1912, 1915)	74 (1910)
Smallest number of days on which rain fell in one year...........	66 (1913)	64 (1899, 1900)	44 (1900)

Thus Van Stadens has the largest amount of rainfall, as we should expect, since it is on a mountain range close to the sea. Rain falls more frequently in Port Elizabeth than in Uitenhage, but we find already the same difference at Redhouse where, as Mrs. T. V. Paterson informed me, it often does not rain when rain is falling at Port Elizabeth. The visitor to these places will find that the climate of Port Elizabeth is much more "clammy" than that of Uitenhage.

For comparison it may be mentioned that, according to Bews, in Natal the average rainfall in inches is 34 ·09, the number of wet days 117, the percentage fall in summer (October to March) 77, in winter (April to September) 23.

A few more data based on these records may be of interest :—

	Van Stadens.	Port Elizabeth.	Uitenhage.
Lowest number of rainy days in summer.......................	34 (1913)	27 (1905)	21 (1899)
Lowest amount of summer rains..	9 ·44″ (1915)	3 ·80″ (1899)	4 ·06″ (1899)
Months in which no rain fell during twenty years.....................	1 (Feb., 1916)	0	3 (Dec., 1913 ; Sept., 1914 ; Feb., 1916)
Number of years in which the amount that fell in winter exceeded the amount which fell in summer.......................	10	15	9

These last numbers are, however, somewhat misleading from our point of view. It is hardly justifiable to divide summer and winter by reckoning summer from October to March. At least September should be included. If we do this we find the numbers modified as follows :—

	1	6	2

In fact the area under discussion is in a region in which summer and winter rains about balance one another, though in some years either one or the other may be of considerably greater amount. A little further east the balance is generally in favour of summer rains, as it is also in the north-eastern part of the Uitenhage division. However suggestive the data which I have abstracted from the records may be, it must not be forgotten the influence of rainfall on vegetation can only in the vaguest way be expressed by averages. It is customary to say that rainfall in South Africa to a large extent determines the nature of the vegetation in any given area, of course apart from soil and other well-known factors, amongst which, however, altitude does not play an important part. Marloth has shown that mists also are a very important factor. These mists, together with the greater certainty of rain on the mountains, show forth the unity of the so-called "Cape Flora." In places such as Uitenhage, where the rainfall is still not inconsiderable, droughts are the most important determining factor, as can be already seen from the fact that cultivation without irrigation is impossible or at best most precarious near Uitenhage, in the Sundays River valley, and the north-western part of the division. Unfortunately a drought cannot be rigidly defined. The following Uitenhage records will, however, show how severe the climate frequently is :—

1897 only 6 months with over 1" of rain (0 in Jan.–Mar., 2 in Oct.–Dec.).
1899 ,, 2 ,, ,, ,, (0 ,, ,, 0 ,, ,,).
1900 ,, 4 ,, ,, ,, (2 ,, ,, 2 ,, ,,).
1903 ,, 5 ,, ,, ,, (0 ,, ,, 2 ,, ,,).
1907 ,, 5 ,, ,, ,, (1 ,, ,, 2 ,, ,,).
1908 ,, 5 ,, ,, ,, (1 ,, ,, 2 ,, ,,).

Taking a similar standard, only the years 1899 and 1900 can be quoted as seasons of drought at Port Elizabeth and none for Van Stadens. Of course, farmers will tell us that severe droughts are much more frequent, but such seasons as I have quoted are in my (unfortunately very imperfect) judgment of most importance for the distribution of the native plants.

SYSTEMATIC ELEMENTS OF THE FLORA.

	Orders.	Genera.	Species.	Non-Native Species.
Gymnosperms.............	3	3	7	—
Monocotyledons...........	22	203	637	about 23
Dicotyledons..............	104	510	1668	,, 81
TOTALS.....	129	716	2312	about 104

For further details see the "Recapitulation" on p. 110.

Compare the corresponding figures for the South-western Region and South-eastern Region published by the late Dr. Bolus in "Science in South Africa," 1905, pp. 215, 221.

Proportion of genera to species, 1 : 3·2.
Proportion of Monocotyledons to Dicotyledons, 1 : 2·6.

Orders represented by more than 35 species :—

Graminaceae (124), Cyperaceae (80), Amaryllidaceae (43), Liliaceae (150), Iridaceae (67), Orchidaceae (70), Aizoaceae (79), Crassulaceae (63), Leguminosae (148), Geraniaceae (40), Euphorbiaceae (52), Umbelliferae (38), Ericaceae (39), Asclepiadaceae (65), Labiatae (40), Scrophulariaceae (62), Acanthaceae (33), Compositae (296).

Orders represented by not more than 5 species (the first number in parentheses gives the numbers of genera, the second that of the species) :—

Cycadaceae (1, 4), Pinaceae (1, 2), Taxaceae (1, 2), Typhaceae (1, 2), Aponogetonaceae (1, 3), Scheuchzeriaceae (1, 3), Hydrocharitaceae (1, 1), Aroidaceae (1, 1), Lemnaceae (2, 3), Commelinaceae (2, 4), Xyridaceae (1, 1), Dioscoraceae (2, 3), Musaceae (1, 2), § Cannaceae (1, 1), Piperaceae (1, 1), Salicaceae (1, 1), Myricaceae (1, 5), Ulmaceae (2, 2), Moraceae (1, 2), Grubbiaceae (1, 1), Rafflesiaceae (1, 1), Phytolaccaceae (4, 5), Portulacaceae (3, 5), § Basellaceae (1, 1), Nymphaeaceae (1, 1), Ranunculaceae (3, 5), Menispermaceae (2, 2), Lauraceae (1, 1), § Papaveraceae (2, 2), Fumariaceae (2, 3), Droseraceae (1, 2), Saxifragaceae (1, 1), Pittosporaceae (1, 1), Cunoniaceae (2, 2), Hamamelidaceae (1, 2), Linaceae (1, 3), Meliaceae (3, 3), Callitrichaceae (1, 1), Aquifoliaceae (1, 1), Icacinaceae (1, 1), Sapindaceae (5, 5), Melianthaceae (1, 1), Balsaminaceae (1, 1), Tiliaceae (2, 3), Violaceae (1, 1), Guttiferae (1, 2), Ochnaceae (1, 2), Elatinaceae (1, 1), Frankeniaceae (1, 2), Achariaceae (2, 2), Penaeaceae (1, 5), Oliniaceae (1, 1), § Lythraceae (1, 1), Combretaceae (1, 1), Myrtaceae (1, 2), § Oenotheraceae (2, 5), Halorrhagidaceae (2, 2), Araliaceae (1, 2), § Cactaceae (3 ?), Cornaceae (1, 1), Myrsinaceae (1, 3), Primulaceae (3, 4), Plumbaginaceae (2, 3), Sapotaceae (1, 1), Salvadoraceae (1, 1), Apocynaceae (4, 5), Bignoniaceae (2, 2), Gesneriaceae (1, 1), Lentibulariaceae (1, 4), Plantaginaceae (1, 5), Valerianaceae (1, 1), Dipsacaceae (2, 2), Goodenoviaceae (1, 1).

NOTE.—Orders marked § consist entirely of non-native species. For details of the remaining orders see the "Recapitulation" on page 110.

Genera represented by more than 15 species :—

Ficinia (23), Aloe (16), Mesembrianthemum (64), Crassula (49), Aspalathus (20), Indigofera (22), Pelargonium (35), Oxalis (19), Agathosma (16), Euphorbia (22), Rhus (21), Hermannia (22), Erica (30), Sutera (16), Helichrysum (40), Senecio (59).

Unrecorded genera distributed both in the south-west and south-east coast region :—

Schoenus, Lapeyrousia, Liparis, Platanthera, Faurea, Hydnora, Anemone, Cryptocarya, Raspalia, Geum, Dumasia, Acmadenia, Cassinopsis, Zizyphus, Sphaeralcea, Sanicula, Ptychotis, Teedia, Bellardia, Nenax, Dicrocephala, Chrysanthemum, Artemisia, Oedera, Landtia.

Here may also be mentioned the fact that Roella stops in the Uitenhage division, but reappears again at East London.

Number of genera extending in the coast districts from a westerly direction only as far as the Port Elizabeth and Uitenhage divisions, 63 ; from the opposite direction, 83 ; number of genera endemic in Uitenhage and Port Elizabeth divisions, 5.

Genera reaching close to the Uitenhage and Port Elizabeth divisions, but not recorded from them :—

From the east : Stangeria, Phoenix, Clivia, Gloriosa, Turraea, Buxus, Mimusops, Lippia, Clerodendron, Siphonoglossa, Pentanisia, Barresia (Spermacoce), Schistostephium.

From the west : Pauridia. (There are sure to be others, but on this point my information is not very precise.)

From the north : Salsola, Sarcocaulon, Augea, Heeria.

NOTES ON PLANT FORMATIONS, PLANT ASSOCIATIONS, ETC.

There is a wide field for local workers to study ecological problems of the flora here dealt with. My own remarks on such points must be rather superficial, as my visits to the two divisions have always been hurried and of brief duration. Even the data of distribution in the accompanying list are still very incomplete.

1. *Shore Vegetation.*—As far as I have seen this, it does not differ essentially from the vegetation in other similar localities along the south coast of South Africa. A narrow belt of shifting sand-dunes separates the sea from the more stable dunes where psammophilous herbaceous vegetation is replaced frequently by a fringe of bush. In the open parts we find *Cnidium suffruticosum, Hydrophylax carnosa, Scaevola Thunbergii, Cryptostemma niveum, Scleropoa rigida, Agropyrum distichum,* etc. *Mundia spinosa* and species of Myrica are not uncommon. The striking *Gasteria Croucheri* has its home here. *Ipomaea biloba,* so much in evidence further east, is only found in a few isolated spots. The shifting sands west of Port Elizabeth have been successfully fixed by extensive plantations of Australian acacias and other plants which have become naturalized. See "Reclamation of Drift Sands in Cape Colony," by C. H. Braine, in *Cape Agric. Journ.*, xxiii (1903), pp. 161-178.

2. *Halophilous Meadows.*—These are particularly well developed at and near the mouth of the Zwartkops River and extend on its right bank to beyond Redhouse. They are the home of many rare plants. Amongst their more common inhabitants are *Spartina stricta, Sporobolus pungens,* species of *Triglochin, Samolus, Statice, Frankenia hirsuta, Chenolea diffusa, Salicornia fruticosa, Suaeda fruticosa.*

3. *Vegetation of Van Stadens Mountains.*—Apart from patches of thorn scrub and forests this has many features of a south-western hill-vegetation. The prevalence of Proteaceae and Ericaceae points to this conclusion, but in addition we find here also five species of Penaea, five Bruniaceae, numerous Rutaceae, several Cliffortias, the leguminous genera Podalyria, Cyclopia, and Priestleya, a species of Caesia, two of Hermas, and in the river beds Prionium Palmita. Acanthaceae, otherwise fairly strongly represented in the two divisions are unrecorded, so are Bignoniaceae and Apocynaceae (apart from Gonioma, which grows in the forest patches); there are a few Rubiaceae, there is no Gasteria, no Haworthia and even no Aloe recorded—thus central and eastern types are much scarcer than in other parts of our areas. Mesembrianthemum is represented only by few species.

The Elandsberg and Great Winterhoek Mountains are very little explored botanically. Much of their vegetation is thorn scrub with occasional patches of forest. The Coxcomb will probably yield a number of south-western types. A few years ago Mr. N. Chase discovered on it *Rochea jasminea.* Other south-western types not recorded from our area, but well known further east near Grahamstown, will be found on the southern slopes of the Zuurberg Range. It is a pity that the exact locality where *Grubbia stricta* was found by Ecklon is not known. He records it from "mountains near Uitenhage."

4. *Vegetation of the Coastal Plateau* (*south of Van Stadens Mountains and east to Port Elizabeth and the Bethelsdorp hills*).—Here thorn scrub is more frequent and eastern types more prevalent than on Van Stadens Mountains. Yet much of the vegetation is of the type of south-western sandy plains. Proteas still form a conspicuous feature of some portions of it. Ericaceae, Restiaceae, several Cliffortias, species of Heliophila, etc., are common. *Microloma lineare* is a favourite of local residents. There are numerous ground orchids, some species being also found on the Cape Peninsula, e.g. *Satyrium Hallackii*, *Schizodium rigidum*, and *Herschelia venusta*. The following also serve to remind one of the south-west: *Lanaria plumosa*, *Cyanella capensis*, *Ianthe* (*Hypoxis*) *aquatica*, *Gethyllis spiralis*. This is also the eastern limit of *Crassula Sphaeritis* (in fact of the sub-genus Sphaeritis), of *Crassula saxifraga*, of the section Hoarea of the genus Pelargonium. There are numerous species of Oxalis, many Anthericums (of which six species are also found on the Cape Peninsula), numerous Ornithogalums, and other bulbous plants. On its south-eastern edge we find *Crassula glomerata* and *Cr. decumbens*, Thunb. (*Bulliarda trichotoma*).

It is interesting to note that, while in 3 and 4 the Graminaceae are prevalently eastern types, the Cyperaceae are more largely represented by south-western types.

5. *Karroid Succulent Vegetation.*—This occupies a large tract of country and is most typically developed in the north-western parts, and merges frequently into the next, the Karroid thorn scrub formation. Travelling from Uitenhage on the Graaff-Reinet railway line, one sees for hours practically nothing but succulent Euphorbias, 2 to 3 feet high, and the Spekboom, *Portulacaria afra*, interspersed with other succulents and species of Asparagus. Though very dreary in aspect during the greater part of the year, it affords an unforgettable sight when, in November and December, the Spekboom is covered with its mass of delicately pink flowers.

6. *Karroid Thorn Scrub.*—This, as stated before, is not always sharply divided from 5. Not only are numerous succulents often mixed with it—on the Zwartkops hills near Redhouse they even preponderate—but patches of pure succulent vegetation frequently occur in it. Tree-Euphorbias are frequent in steep well-drained localities.

In its purest form it is found in the western and central part of the "Addo bush," where it forms a dense growth of an average height of about 10 to 14 feet, which shelters a herd of elephants (frequently in a locality plainly visible from Port Elizabeth). There are buffaloes still to be found. Both would have been exterminated long ago, although nominally they are under Government protection, if they were not firmly entrenched in the almost impenetrable thorn scrub, which in many parts it does not pay to remove as the soil on which it grows is frequently very poor and sandy. Reference to its occurrence in the south-western parts of our area has already been made. In a north-easterly direction it crosses the Zuurberg Range into the Fish River valley.

Here we find a number of Celastraceae, species of *Rhus* (including *Rh. longispina*), *Grewia*, *Doryalis*, *Scolopia*, *Schotia*, *Capparis*, *Euclea*, *Royena*, *Olea*, *Lycium*, *Brachylaena*, *Tarchonanthus*, *Osteospermum*, *Asparagus*, *Acacia horrida*, *Heteromorpha arborescens*, *Azima tetracantha*, *Carissa Arduina*, *Ehretia hottentottica*, *Randia rudis*, and other woody Rubiaceae (e.g. *Pavetta lanceolata*), *Rhigozum obovatum*. Some of these, especially the last named, make a fine show when in flower in summer. Shrubby species of *Cotyledon*, *Crassula perfoliata*, numerous species of *Pelargonium* and *Mesembrianthemum*, *Clematis brachiata*, several species of *Zygophyllum*, *Tecomaria capensis*, *Plumbago capensis*, several Jasmins, a number of Acanthaceae, several showy species of *Albuca* and other bulbous plants—all add to the attractiveness of the scene when seen in summer; while in winter some stately *Aloes*, especially *A. pluridens*, *ferox*, *africana*, and *speciosa*, brighten the landscape.

In parts *Portulacaria afra* is very common and forms a most important food plant of elephants and other large herbivorous animals. On the other hand, *Crassula portulacea*, which is also common in some localities and resembles the Spekboom is not touched by them. Scandent Senecios are not uncommon, also twining Asclepiads, especially *Sarcostemma viminalis*. In fact the majority of Asclepiads occurring in our area are found in the thorn scrub tract. *Testudinaria elephantipes* is not uncommon in rocky situations. *Sansevieria thyrsiflora* is very common. Several species of *Encephalartos* are met with.

It will be seen that the thorn scrub, like the succulent Karroid vegetation, consists very largely of extreme xerophytes. Such an extensive conglomerate of extreme xerophytes points to a very great age of these formations, as has been shown by Engler in his paper "Ueber Herkunft, Alter und Verbreitung extremer xerothermer Pflanzen in Sitzungsber d. k. Preuss. Ak. d.Wissenschaften XX, 1914," p. 564, and it is interesting to note that Engler, though dealing with the vegetation of the whole world, mentions many of the plants found in these formations in our area. Valuable information on a number of them will also be found in Marloth's "Das Kapland," Jena, 1908.

The question of the cause of thorn development is not clearly decided yet. A résumé of recent work on this point will be found in "The Growth-forms of Natal Plants," by J. W. Bews (*Trans. Roy. Soc. S.Afr.*, V. p. 614). He also records a number of observations on Natal thorny plants which will be of value to students in our parts.

Between Coega and the Sundays River the thorn scrub is partly replaced by Karroid shrublets which include *Pentzia virgata*.

7. *Acacia Formation.*—Marloth (in "Das Kapland," p. 57) says, in speaking of the vegetation of the parts here dealt with, "when these parts are better investigated it may become necessary to distinguish as a separate formation these Euphorbia and Thornbush thickets from the more eastern Acacia formation." This I have done. However, no mathematical line can be drawn between them. In the Acacia formation we find stretches of grass country dotted over with *Acacia horrida*. The latter frequently serves as a nucleus for plant associations of which other thorny plants always form some of the constituents. In our area pure Acacia formation is not extensive and occurs in the eastern and north-eastern portions. I also noticed it near the mouth of the Gamtoos River.

8. *Pure Grassland Formation* is found on a large part of the Zuurberg, on the "Grass Ridge" east of Uitenhage and east of the Sundays River near its mouth.

9. *Forest Patches.*—These occur almost entirely in deep kloofs on the southern side of the mountains and hills and close to the sea. They are of the "Knysna type," though no doubt they will be found to vary more or less. Thus *Virgilia capensis* finds its eastern limit in the kloof traversed by the Van Stadens Pass; *Ocotea bullata* occurs only, as far as my information goes, in a patch on the Elandsberg; on the farm Kamaehs, north of Uitenhage, a patch contains numerous specimens of the famous *Sterculia Alexandri,* which in isolated specimens is only known from a couple of other localities in our area. It is perhaps to be looked upon as a relict from the time when forests had a wider distribution in our southern coast-belt. Similar plant-relicts are known from other South African forest areas, and there are some interesting examples amongst animals associated with our forest patches. Detailed information on the plants found in the Knysna type of forest is contained in Marloth's "Das Kapland," p. 190, and in Sim's "The Forests and the Forest Flora of Cape Colony." Frequently forest patches merge into thorn scrub.

It may be of interest to record the water and swamp plants as well as the phanerogamic Epiphytes and Parasites:—

(*a*) Water and swamp plants—

Typha (2 species), *Potamogeton* (5), *Aponogeton* (3), *Lagarosiphon muscoides*, *Crassula natans*, *Myrsiphyllum spicatum*, *Utricularia* (3), numerous Cyperaceae, *Zantedeschia aethiopica*, *Juncus* (several species), *Prionium Palmita*, *Ianthe aquatica*, *Crinum* (3), *Ranunculus capensis*, *Crassula inanis*, *Callitriche* (*C. Bolusii ?*), *Laurembergia repens*, *Gunnera perpensa*, *Villarsia ovata*, *Limnanthemum thunbergianum*, *Mentha* (2), *Ilysanthes riparia.*

(*b*) Phanerogamic Epiphytes—

Polystachia pubescens, *Angraecum* (3 species), *Listrostachys arcuata*, *Mystacidium filicorne.*

(*c*) Phanerogamic Parasites—

Loranthus elegans, *Viscum* (5 species, including the remarkable *V. minimum*, and *V. Crassulae*), *Thesium* (26), *Cytinus dioicus*, *Cassytha ciliolata*, *Cuscuta* (2), and 14 species of Scrophulariaceae of which the following are holoparasites: *Striga orobanchoides*, *Hyobanche sanguinea*, and 3 species of *Harveya.* It is strange that *Hydnora africana* has not been recorded, as it occurs both east and west of our area.

PHYTOGEOGRAPHY.

It was early recognized that in the districts of Uitenhage and Port Elizabeth an important phytogeographical boundary is found. Thus already Ecklon in his "List of Plants Found in the District of Uitenhage, collected during the months of July, 1829, and February, 1830" (*S.A. Quart. Journ.*, 1830), stated on p. 358: "It seems that the Winterhoek Mountain forms the limit of what may be called the Cape Flora, and which distinguishes itself by its representatives, *Erica*, *Protea*, etc., while that by which it is supplanted may be called the Flora of Caffraria." The matter is, however, not so simple as it looks at first sight and as it has been taken by most writers. It is true a large number of genera find in this area their eastern or western limit. I find that 62 genera extend in our coast districts from a western direction only to our area, and 83 genera from an eastern direction. In addition 5 genera have not been found outside it. These numbers will undoubtedly be modified as our knowledge increases, but even if they were considerably reduced they would command attention. However, without having resource to statistics, one has only to take a stroll on the "Cape Road," near Port Elizabeth or near Walmer, and cannot help being struck with the fact that here the flora is essentially south-western. On the Zwartkops hills an essentially karroid vegetation prevails. In the kloofs we find the same types and mostly the same species found at the Knysna and in the kloofs near Grahamstown, while in the eastern parts, and especially in the adjoining district of Alexandria, eastern types become more common. Especially differences in rainfall, no doubt largely account for these changes in vegetation, and the tongue of karroid vegetation reaching almost to the sea from Port Elizabeth to the mouth of the Sundays River, helps to prevent the intermingling of eastern and western types. We must, however, not forget that a large number of genera and even of species are found in our area both east and west of it. This has led the editor of the recent volumes of the "Flora Capensis" to lump the coast districts from the Oliphants River in the west to Natal under the name of the "Coast Region," but no South African botanist will agree that this was a wise proceeding. The south-west coast region and the south-east coast region are so well characterized by prominent types that it is most advisable to keep them up. This is not the place to deal with this matter in detail; moreover it has been frequently dealt with by Bolus, Marloth, and others. The question only is, where to draw the line? Quite a fair number of south-western types find their eastern limit near Grahamstown, but with them we find karroid and eastern types. However, karroid and eastern types also extend to the Cape Peninsula and beyond. Some south-western types extend far into the south-eastern region. The truth of the matter is, that in a continental area no absolutely sharp boundaries between large geographical regions can be drawn, they must be more or less conventional and preferably they should be purely geographical, bounded by mountain ranges or river systems. On these lines Bolus's and Engler's primary divisions of South Africa into phytogeographical regions have been made (see e.g. Bolus in "Science in South Africa," 1905, and Engler, "Die Pflanzenwelt Afrikas," Vol. I). Having fixed our geographical limits we can next proceed to work out the plant-formations and plant-associations as has been done by Marloth for a portion of Cape Colony, and Bews for Natal. Some formations and associations have often very sharp boundaries. I am led to make these remarks to show how little it matters whether we accept, e.g., Bolus's or Engler's primary divisions. The latter, following Rehmann, has a transition sub-region for Van Stadens to Mossel Bay, before he comes to the region of south-west Cape Colony, but Bolus has already pointed out that this simply introduces an additional artificial boundary. It is also inadmissable, because the Langkloof has an almost pure south-western flora. If geographical and topographical divisions of the country should be used in primary divisions for phytogeographical purposes it follows further that they should have geographical names, but these should be clear, especially to people living in this country. For instance, the term "Karroo Region" should be dropped and the much better term used in the "Flora Capensis"—"Central Region"—be substituted. We can then use the excellent term "karroid" not only for the vegetation of the Karroo but for similar vegetation in other parts of South Africa and even other parts of the world, e.g. East Africa. For the same reason I would reject the term "Kalahari Region." If I promised to take a South African to the Kalahari Region, and I landed him in the Orange Free State or at Barberton he would not know what to make of it. For similar reasons I would reject such terms as "Cape Province," as used by Marloth (e.g. in "Report of the 75th Meeting of the British Assoc. for the Adv. of Science," 1906, p. 598, and "Das Kapland," 1908).

After this digression it will be seen that, on the whole, I accept for our area the divisions adopted by Bolus, only I prefer to place the eastern boundary of the south-west coast region not at Van Stadens but in a line from Port Elizabeth through the Bethelsdorp hills.

LIST OF THE PHANEROGAMIC PLANTS FOUND IN THE DIVISIONS OF UITENHAGE AND PORT ELIZABETH.

Explanation of Signs and Abbreviations.

* means that I have not seen the species from these divisions, and the reference is taken from the literature only.

† means the species so marked is found on the Cape Peninsula.

‡ means the species so marked is found in Natal.

§ means the species is not native in my opinion.

Uit. = Uitenhage.
P.E. = Port Elizabeth.
T.V.P. = T. V. Paterson.
J.L.D. = J. L. Drege.
W.K. = W. H. Kemsley.

GYMNOSPERMAE.

CYCADACEAE.

Encephalartos Lehm.

1. *caffer* Miq.—Kamaehs; Van Stadens Mts.; Zuurberg.
2. *horridus* Lehm.—Redhouse, Perseverance, etc.
3. **cycadifolius* Lehm.—Near the Zwartkops R., 20 to 100 ft. (*teste* Ecklon).
4. **longifolius* Lehm.—Hills near Uitenhage, 200 to 800 ft. (*teste* Ecklon).

PINACEAE.

Widdringtonia Endl.

†‡1. *cupressoides* Endl.—Zuurberg, Mar.; Kamaehs.

TAXACEAE.

Podocarpus L'Herit.

‡1. *elongata* L'Her.—Springfields, Mar.; Zuurberg, Mar.; Van Stadens Pass.

‡2. **latifolia* R. Br.—Though not specially recorded, this species is sure to occur in our districts.

ANGIOSPERMAE.

MONOCOTYLEDONES.

TYPHACEAE.

Typha L.

†1. **australis* Schum.—Between Van Stadens Mts. and Bethelsdorp.
†‡2. *capensis* Rohrb.—Redhouse, Apr.

POTAMOGETONACEAE.

Potamogeton L.

‡1. **natans* L.—Near the Zwartkops R., Dec.
‡2. **americanus* Cham.—Uit. div.
‡3. **lucens* L.—Uit. div.
‡4. *Friesii* Ruprecht—Elands R., Dec.; Baakens R. valley, Jan.
5. **pectinatum* L.—Zwartkops R.

Zostera L.

1. *marina* L. var. *angustifolia* Hornem.—Zwartkops R. at Redhouse.

APONOGETONACEAE.

Aponogeton Thunb.

1. *Kraussianum* Hochst.—Despatch, Oct.; Kamkas, Nov.
‡2. *spathaceum*, E. Mey.—Bethelsdorp, Sept.; P.E., Nov.; Uit. E. and Z. (var. *junceum*).
†3. **distachyon* L.—Uit. div.

SCHEUCHZERIACEAE.

Triglochin L.

‡1. *bulbosum* L.—Walmer, Oct.; P.E., Nov.; Cape Recife, Feb.
†‡2. *laxiflorum* Guss.—Redhouse, Mar.
†‡3. *striatum* Ruiz et Pavon.—P.E., Nov.; Van Stadens R.; Redhouse, Oct.

HYDROCHARITACEAE.

Lagarosiphon Harv.

‡1. *muscoides* Harv.—P.E., Feb. and Oct.; Redhouse.

GRAMINACEAE.

Erianthus Mich.

‡1. *capensis* Nees—Redhouse, Apr.
2. *Sorghum* Nees—Zuurberg, Mar.

Pollinia, Trin.

‡1. **villosa* Spreng.—Rocky slopes of Van Stadens Mts.

Rottboellia Linn. f.

†‡1. *compressa* L.—Zwartkops R.

Trachypogon Nees

‡1. *polymorphus* Hack.—Between Kromme R. and Kraggakamma; P.E.

Elionurus Humb. et Bonpl.

‡1. **argenteus* Nees—Near the Zwartkops R.

ANDROPOGON L.
- †‡1. *eucomus* Nees—Schoenmaakers Kop, Apr.; Walmer, May.
- ‡2. *appendiculatus* Nees—Bethelsdorp, Nov.
- ‡3. **filifolius* Steud.—P.E.
- ‡4. **contortus* Linn.—Near the Zwartkops R.
- †‡5. *Nardus* Linn.—Bethelsdorp, Nov.; P.E., Oct.
- †‡6. *hirtus* Linn.—Redhouse, June, Sept., and Nov.
- ‡7. **auctus* Stapf—Uit. div.

ANTHISTIRIA Linn. f.
- †‡1. *imberbis* Retz.—Aloes, Sept. Var. *argentea* Stapf—Between Coega and Sundays R.
- 2. *ciliata* L.—Redhouse, Oct.

PASPALUM L.
- ‡1. *scrobiculatum* L.—Zwartkops R., Jan., Z. 4451.

DIGITARIA Rich.
- ‡1. *monodactyla* Stapf—Addo.
- ‡2. *eriantha* Steud.—Redhouse, Oct.; Earn Cliff, near P.E., Mar., Galpin 6384; Cradock Place, P.E., May, Galpin 6383; Uit., E. and Z. 84; Zwartkops R., May, E. and Z. 21.
- ‡3. *ternata* Stapf—Redhouse, May.
- †‡4. *sanguinalis* Scop.—Zwartkops R., Jan.

PANICUM L.
- ‡1. *serratum* Spreng.—Redhouse, Mar.
- ‡2. *arrectum* Hack.—Uit.
- ‡3. *pyramidale* Lam. var. *hebetatum*.—Uit., Jan.
- †‡4. §*Crus-Galli* L.—Frames Drift, Mar.
- ‡5. *deustum* Thunb.—P.E., Oct.; Uit., May, E. and Z. 451.
- ‡6. *maximum* Jacq.—Redhouse, Oct.; Uit.
- 7. *minus* Stapf—Uit., Oct. and Nov., E. and Z. 478.

OPLISMENUS L.
- ‡1. *africanus* Beauv.—Springfields, Mar.

SETARIA Beauv.
- ‡1. *perennis* Hack.—P.E.; near the Zwartkops R.; hills of Addo, E. and Z. 176.
- 2. **flabellata* Stapf—Zwartkops R.; P.E.
- ‡3. *aurea* A. Br.—Redhouse.
- ‡4. **imberbis* Roem.—Zwartkops R.
- ‡5. *verticillata* Beauv.—Uit., Apr.

PENNISETUM Pers.
- †‡1. *macrourum* Trin.—Zwartkops R., Z. 4468.
- †‡2. **Thunbergii* Kunth—Near Uit.

STENOTAPHRUM Trin.
- †‡1. *glabrum* Trin.—Humewood, July; P.E., Nov.; on meadow-like spots near the Zwartkops R., E. and Z. 440; Uit., Nov.

TRICHOLAENA Schrad.
- ‡1. *setifolia* Stapf—Redhouse, Oct.; P.E., June.

ARUNDINELLA Raddi
- ‡1. *Ecklonii* Nees—Zwartkops R., Mar.; Uit.

TRISTACHYA Nees
- ‡1. *leucothrix* Trin.—Walmer, Oct.; Zuurberg.

Achneria Munro

†1. *ampla* Dur. et Schinz—Redhouse, Feb.

Aira L.

†1. §*caryophyllea* L.—Redhouse, Oct.

Koeleria Pers.

†‡1. **cristata* Pers.—Zwartkops R.; near Uit.; hills near Addo.

Avenastrum Juss.

‡1. *turgidulum* Stapf—Zwartkops R. Z. 463.
2. **antarcticum* Stapf—Zwartkops R.

Pentaschistis Stapf

1. *viscidula* Stapf—Bethelsdorp, Nov.; P.E., Nov.
†2. *curvifolia* Stapf—Walmer.
3. **Zeyheri* Stapf—Near Zwartkops R.
†4. *angustifolia* Stapf—Gamtoos R.; P.E.
5. *heptamera* Stapf—On the sand-hills near the Zwartkops R., Dec. E. et Z. 659 et Z. 4533.

Danthonia DC.

1. *papposa* Nees—Van Stadens, Dec.; Uit., Nov.
2. **cincta* Nees—Zwartkops R.; between Van Stadens Mts. Range and Bethelsdorp; between Leadmine R. and Van Stadens R.
3. *disticha* Nees—Redhouse, Nov. and Oct.
†4. *curva* Nees—Redhouse, Nov.; Uit.
5. **inermis* Stapf—Near P.E.

Arundo L.

1. §*Donax* L.—Walmer.

Phragmites Trin.

†‡1. *communis* Trin.—P.E.; Redhouse, Apr.; Uit., Mar.

Lagurus L.

†1. §*ovatus* L.—P.E.

Polypogon Desf.

‡1. *monspeliensis* Desf.—Baakens R. valley, Nov.; Uit., Dec.
2. *tenuis* Brongn.—P.E., Dec.; Uit., Nov., E. and Z. 430.

Agrostis L.

†‡1. *lachnantha* Nees—Zwartkops R., Dec., Z. 173.

Aristida L.

‡1. *Adscensionis* L. (= *Chaetaria curvata* Nees).—Near Uit., Apr.
‡2. *congesta* R. et Sch.—Near Uit., Schlechter 2548 and E. and Z.
†‡3. *barbicollis* Trin.—Between Coega and Sundays R., Nov., E. and Z.
†‡4. *vestita* Thunb.—Redhouse, Oct.; on the grass fields near the Zwartkops R., Dec., E. and Z. 447; between Sundays and the Coega R.
†5. *capensis* Thunb.—Schoenmaakers Kop, Mar.; Humewood, Mar.; on downs between Coega and Sundays R., Z. 502 and 4501.
6. *Zeyheri* Nees (= *A. capensis* Thunb. var. *Zeyheri* Trin.)—P.E., May.

STIPA L.
- ‡1. *dregeana* Steud.—P.E., July; Van Stadens, May; Uit.; in the fields of Addo and by the Zwartkops R.; E. and Z. 770.

TRAGUS Haller
- 1. *koelerioides* Aschers.—Redhouse, Dec.; near Sundays R., May; E. and Z. 45; Uit., Apr.; Schlechter 2506.
- ‡2. *racemosus* All.—Sundays R., May; E. and Z. 46; Zwartkops R.; E. and Z.; Uit., Apr.; Schlechter 2555.

SPOROBOLUS R. Br.
- 1. *ioclados* Nees—Uit., Apr., E. and Z.
- 2. *fimbriatus* Nees—Zuurberg, Mar.; Zwartkops R.
- †‡3. *indicus* R. Br.—P.E., Oct.; Zuurberg, Mar.
- †‡4. *pungens* Kunth—Redhouse, Oct.; Van Stadens R.; at the mouth of the Zwartkops R., Jan. and Sept.

DIPLACHNE Beauv.
- †‡1. *fusca* Beauv.—Redhouse, Aug.

ERAGROSTIS Beauv.
- †‡1. *curvula* Nees—Redhouse, Mar.; Van Stadens Mts., Oct.; Uit., Apr.; Schlechter 2509; Cradock Place, May; Galpin 6382.
- 2. *porosa* Nees—Redhouse, Oct.; Uit., Apr.; Schlechter 2554; E. and Z.
- 3. *micrantha* Hack.—Uit., Apr.; Schlechter 2509.
- ‡4. *plana* Nees—Redhouse, Feb.
- ‡5. *chalcantha* Trin.—Van Stadens Mts., Oct. and Nov.; Zeyher 1835, 7.
- †‡6. *brizoides* Nees—Redhouse, Oct.; P.E., Nov.; on fields near the Zwartkops R., Oct.; E. and Z. 238.
- 7. *obtusa* Munro—Redhouse, Oct.; Uit., Apr.; Schlechter 2554; E. and Z.
- ‡8. *gummiflua* Nees—Redhouse, Mar.; Zwartkops R., Oct.; Uit., Jan.; Bethelsdorp, Oct.; E. and Z. 12.

SPARTINA Schreb.
- †1. *stricta* Roth—Zwartkops R., Jan.; along the strand of Algoa Bay, near P.E.; Cape Recife; E. and Z. 662.

CYNODON Pers.
- †‡1. *Dactylon* Pers.—Redhouse, June.
- 2. *incompletus* Nees—Near Uit., Nov. and Apr.; E. and Z.

MICROCHLOA R. Br.
- ‡1. *caffra* Nees—Near the Zwartkops R.

HARPECHLOA Kunth
- ‡1. *capensis* Kunth—Walmer, Nov.

CHLORIS Swartz
- ‡1. *virgata* Sw.—Redhouse, Apr.; near Uit.; Schlechter 2504.
- ‡2. *petraea* Thunb.—Bethelsdorp, Nov.; Uit., Jan.; Zwartkops R.; Z. 1823.

ELEUSINE Gaertn.
- †‡1. §*indica* Gaertn.—P.E., Dec.

TRIRAPHIS R. Br.
- ‡1. *Rehmanni* Hack.—Near Uit., Apr., Schlechter 2515; Zwartkops R., Feb.; on sand-hills near the Zwartkops R., E. and Z. 85, 1829; Redhouse, Mar.

LEERSIA Sw.

‡1. *hexandra* Sw.—Moist spots in channel of Zwartkops R., E. and Z. 510.

EHRHARTA Thunb.

‡1. *erecta* Lam.—Redhouse, Aug.; Zwartkops R., Sept. and Nov., E. and Z.; Uit., Nov.

†‡2. *calycina* Sm.—Redhouse, Oct.; between Coega and Sundays R., Nov.; Addo, Sept.

3. *ramosa* Thunb.—Van Stadens Mts., Oct., Z. 4510.

†4. *aphylla* Schrad.—Van Stadens Mts., Oct. and Nov., E. and Z. 293.

5. *gigantea* Thunb.—On sand-hills near the Zwartkops R., E. and Z. 253; Humewood, Oct.

†6. *villosa* Schult. var. *maxima*.—On downs along the strand of Algoa Bay, Jan., E. and Z. 409; Zwartkops R., Sept., Z. 4509, 4508.

PHALARIS L.

†‡1. §*minor* Retz.—Redhouse, Sept. and Oct.

‡2. *arundinacea* L.—Van Stadens Mts.

MELICA L.

†‡1. *racemosa* Thunb.—Redhouse, June and Oct.; Walmer, Nov.; Uit., Apr., Schlechter 2577; sand-hills near the Zwartkops R., E. and Z. 253.

FINGERHUTHIA Nees

‡1. *sesleriaeformis* Nees.—Near P.E., Jan., Z. 4506.

SCHISMUS Beauv.

1. *fasciculatus* Beauv.—P.E., Oct. Var. *tenuis* Stapf, near Uit., Z.

2. **koelerioides* Stapf—Near the mouth of the Zwartkops R.

LASIOCHLOA Kunth

†1. *longifolia* Kunth—Redhouse, April and Oct.; Walmer, Oct.

2. *obtusifolia* Nees—Near the Zwartkops R., E. and Z. 4592, 102.

BRIZOPYRUM Nees

†1. *capense* Trin.—Near Van Stadens R.; between Coega and Zwartkops R., Z. 1039; Redhouse, Dec.

BRIZA L.

†1. §*maxima* L.—Bethelsdorp, Nov.; P.E., Sept.

†‡2. §*minor* L.—Bethelsdorp, Nov.; Uit., Schlechter 2554.

POA Linn.

‡1. *binata* Nees—P.E., Aug.

ATROPIS Griseb.

1. **angusta* Stapf—Zwartkops R.

SCLEROPOA Griseb.

†1. §*rigida* Griseb.—Humewood, Oct. and Nov.

FESTUCA L.

‡1. *scabra* Nees—Bethelsdorp, Nov.; Van Stadens Mts., Oct., Z. 4594; on the flats near the Van Stadens Mts., E. and Z. 290.

VULPIA Gmel.
†‡1. *§*Myuros* Gmel.—Zwartkops R.
†2. §*bromoides* S. F. Gray—Baakens R. valley, Nov.; Zwartkops R.; near Uit., Oct.

BROMUS L.
†1. §*molliformis* Lloyd—Humewood, Nov.
†2. §*patulus* Mer.—Redhouse, Nov.
†‡3. §*maximus* L.—Redhouse, Oct. and Dec.
†‡4. §*unioloides* H. B. K.—Redhouse, Sept.

LOLIUM L.
†‡1. §*temulentum* Linn.—Coega; P.E., Dec.
2. §*perenne* L. var.—P.E., Oct.
? 3. §*rigidum* Gaud.—Redhouse, T.V.P. (Has narrower leaves than *L. temulentum* Linn., but is more luxuriant than the type of *L. rigidum*.)
† ? 4. §*multiflorum* Lam.—Redhouse, T.V.P. 403*a*. (This may, however, be a cultivated form of *L. perenne* L.)

LEPTURUS R. Br.
†1. **cylindricus* Trin.—Near Uit.

AGROPYRUM Gaertn.
†1. *distichum* Beauv.—Cape Recife, Jan.; Governor's Kop, Sim 2725; P.E., near the mouth of the Zwartkops R., Jan.

HORDEUM L.
†1. §*murinum* L.—Redhouse, Dec.; P.E., Oct.

(BAMBUSA Schreb.
1. §*vulgaris* Nees.—Uit., in *hortis*, Zeyher.)

CYPERACEAE.[‖]

KYLLINGA Rottb.
‡1. *alba* Nees, var. *alatā* C. B. Cl.—Redhouse, Oct.
‡2. *erecta* Schum.—Redhouse, Nov.; Uit., Mar., E. and Z.

PYCREUS Beauv.
†‡1. *Mundtii* Nees—Uit., Apr., Schlechter 2553.
†‡2. *polystachyus* Beauv.—By the Zwartkops R.; Zuurberg.
‡3. *ferrugineus* C. B. Cl.—Schoenmaker's Kop, T.V.P. 546.
†‡4. *umbrosus* Nees—Zwartkops R., Z. 4357; Van Stadens R., Dec.; Uit., Apr., Schlechter 2550; Zuurberg, Mar.
‡5. *macranthus* C. B. Cl.—Zuurberg.
6. *sp.*—Humewood, Dec., T.V.P. 2654*a*. This is near *P. angulatus* Nees, but the specimens seen are too poor for accurate determination.

[‖] There are several *Cyperaceae* in the Herbarium of the Albany Museum from the Uitenhage and Port Elizabeth divisions, which are not included in this list as it was not possible to determine them accurately. The most noteworthy of them is a plant collected in flower only at Walmer by Mrs. T. V. Paterson (No. 2028, Aug., 1914). It resembles *Tetraria Burmanni* C. B. Cl. I am inclined to make it the type of a new genus, but it is not advisable to deal with it until I can finish a revision of the genus *Tetraria* on which I am engaged.

JUNCELLUS C. B. Clarke.

†‡1. *laevigatus* C. B. Cl.—P.E., Dec.

CYPERUS L.

†1. *tenellus* L.—Van Stadens Mts.
‡2. *Teneriffae* Poir.—Uit. div., Schlechter 2485.
‡3. **compactus* Lam.—Uit. div.
4 *semitrifidus* Schrad.—P.E., Mar.; Uit., Apr., Schlechter 2513.
‡5. *difformis* L.—Van Stadens Mts.
6. *pulcher* Thunb.—Kamaehs, Nov.
†‡7. *sphaerospermus* Schrad.—Bethelsdorp, Nov.; Uit., Dec., Z. 4359, Apr., Schlechter 2553; Walmer, Nov.
†‡8. *denudatus* L. f.—Near the mouth of the Zwartkops R.
†9. *textilis* Thunb.—Redhouse, Oct.; P.E., W.K.
‡10. *albostriatus* Schrad.—P.E. Valley, Apr.; Zuurberg, Apr.; Uit., Apr., Schlechter 2569.
11. *usitatus* Burch.—Humewood, Apr.; Redhouse, Mar.; P.E., Mar.; Uit., Apr., Schlechter 2500.
‡12. *rotundus* L.—Redhouse, Mar.
†‡13. *fastigiatus* Rottb.—Uit., Apr.

NOTE.—E. and Z. 9, in Herb. S.A. Mus., named *C. haspan* L., appears to be *C. denudatus* L. f. It was found on the Van Stadens R. *C. marginatus* Thunb. is quoted from the P.E. div. in the "Flora Capensis," VII, p. 74. I have left this species out pending confirmation.

MARISCUS Gaertn.

‡1. *capensis* Schrad.—P.E., Mar.
†‡2. *congestus* C. B. Cl.—Walmer, Oct. and Jan.; Schoenmaakers Kop, Apr.; Zuurberg, Apr.
†3. *riparius* Schrad.—Oct.; P.E. Valley, Sept.
‡4. *elatior* C. B. Cl.—Frames Drift, Oct.; Walmer, Oct.
5. *involutus* C. B. Cl.—Van Stadens R., Dec.
‡6. **Gueinzii* C. B. Cl.—Zwartkops R.
†7. *tabularis* Schrad.—Uit., 50 to 500 ft., E. and Z.; Redhouse.
8. *durus* C. B. Cl.—P.E. Valley, T.V.P. 2317.

ELEOCHARIS R. Br.

‡1. *limosa* Schultes—Baakens River Valley, Nov.; Redhouse, Dec.; in marshy places along the Zwartkops R., Z. 4423.

FIMBRISTYLIS Vahl

‡1. **complanata* Link—Van Stadens Hoogte.

BULBOSTYLIS Kunth

†‡1. **humilis* Kunth—P.E.; Zwartkops R.
‡2. *collina* Kth.—P.E., Redhouse, Aug.

SCIRPUS L.

†1. *Ludwigii* Boeck.—Uit. div.; Van Stadens.
†2. **tenuissimus* Boeck.—Waterpools near the Zwartkops R.
†3. **verrucosulus* Steud.—P.E.
4. **setaceus* L.—Uit. div.
5. *costatus* Boeck.—Van Stadens.
†‡6. *cernuus* Vahl—Redhouse, Aug.; Van Stadens.
†7. *incomptulus* Boeck.—Redhouse, Aug. and Sept.
†8. *antarcticus* L.—Walmer, Nov.
†9. *nodosus* Rottb.—Redhouse, May; near the mouth of the Van Stadens R.
‡10. *paludicola* Kth.—Sandy places near the Zwartkops R.
†‡11. *prolifer* Rottb.—P.E., Nov.; Springfields, Nov., T.V.P. 3301; Van Stadens R.
12. *Holoschoenus* L.—Van Stadens Hoogte; P.E. div., along the coast.
†‡13. *littoralis* Schrad.—Chatty R.; Redhouse, Mar.
†14. *maritimus* L.—Redhouse, May; Green Bushes, P.E., Dec.; Humewood.

FICINIA Schrad.

†1. *aphylla* Nees—Humewood, Apr.; Cape Recife, Jan.
2. **repens* Kunth—Zwartkops R.
3. **sylvatica* Kunth—Van Stadens Mts.
4. *leiocarpa* Nees—Van Stadens Mts., July.
†5. *filiformis* Schrad.—Redhouse, June; Humewood; Van Stadens, Oct.
†‡6. ? *stolonifera* Boeck.—Walmer, July, T.V.P. 619*b*. Material insufficient.
†7. *tristachya* Nees—Bethelsdorp, Nov.
8. *involuta* Nees—Near Van Stadens Mts., MacOwan 2176.
†9. **albicans* Nees—Uit. div.
†10. *laciniata* Nees—Near Zwartkops R., Oct., Zey. 4415; seashore, New Brighton, May, Galpin 6425.
11. *truncata* Schrad.—P.E., Sept.; Redhouse; mouth of Zwartkops R., Z. 4418.
12. *praemorsa* Nees—Between Zwartkops and Sundays Rs., June.
†13. *ecklonea* Nees—Walmer, July.
†14. **laevis* Nees—Between Coega and Sundays Rs.
†15. *gracilis* Schrad.—Zwartkops R., Z. 4413.
16. **latinux* C.B. Cl.—Uit.
†17. *setiformis* Schrad.—Near Zwartkops R., Z. 4391, 4395. (Walmer, T.V.P. 1071, July, is close to *F. setiformis* Schrad, but apparently not identical with it.)
†18. *n. sp.* aff. *lithospermae* Nees—Humewood, Aug.; P.E., Oct.; P.E. Valley, Sept.
†19. *bracteata* Boeck.—Redhouse, June; Humewood, May; Walmer, May; Earn Cliff, near P.E., May.
†20. *bulbosa* Nees—Redhouse, Sept., Oct.; P.E., Sept.
†21. **secunda* Kunth—Uit. div.
†22. *ramosissima* Kunth—Sandhills, at P.E.

FUIRENA Rottb.

†‡1. *pubescens* Kth.—Bethelsdorp, Nov.
†2. *hirta* Vahl—Walmer, Nov.; Bethelsdorp, Jan.; Uit., Jan.

CARPHA R. Br.

†1. *glomerata* Nees—Walmer, Oct.; Van Stadens, Nov.

TETRARIA Beauv.

†1. *cuspidata* C. B. Cl.—Redhouse, June; Walmer, Oct.; Humewood. June; Earn Cliff, near P.E., May.
2. *thermalis* C. B. Cl.—Frames Drift, Mar.

MACROCHAETIUM Steud.

†1. *Dregei* Steud.—Van Stadens Mts.; P.E., Dec.

CLADIUM P. Browne

†‡1. *mariscus* R. Br.—P.E., Jan.; Van Stadens R.

SCHOENOXIPHIUM Nees

‡1. **rufum* Nees—P.E.
†2. *Ecklonii* Nees—P.E., July (*Carex bisexualis* C. B. Cl. in Fl. Cap.).

CAREX Linn.

†1. **glomerata* Thunb.—Zwartkops R.
†‡2. *extensa* Gooden.—Walmer, Oct.; P.E., Nov.
†3. **aethiopica* Schk.—In the forests on Van Stadens Mts.
†4. *clavata* Thunb.—Walmer, Nov.

AROIDACEAE.

ZANTEDESCHIA Spreng.

†‡1. *aethiopica* Spreng. (= *Richardia africana* Kth.)—Bethelsdorp, Nov.

LEMNACEAE.

WOLFFIA Hook.

†‡1. *sp.* I have seen flowerless specimens from P.E.

LEMNA L.

†‡1. **minor* L.—Zwartkops R., in stagnant places.
†‡2. *gibba* L.—Near the mouth of the Zwartkops R.; P.E.

RESTIACEAE.

RESTIO L.

†1. *cuspidatus* Thunb.—Earn Cliff, near P.E.; Redhouse; Bethelsdorp; P.E.
2. *tetragonus* Thunb.—Walmer.
3. *Rhodocoma* Mast.—Perseverance; Van Stadens; Springfields; Zuurberg.
4. *callistachyus* Kth.—Van Stadens; Springfields; channel of Zwartkops R., E. and Z. 539.
5. *sp.*, near *R. subverticillatus* Nees—Van Stadens, T.V.P. 2517, 2419; Humewood, June, T.V.P. 1099, 1100; Walmer, Nov., T.V.P. 2366; Earn Cliff, near P.E., May, Galpin 8392; P.E., June, Potts 301.

Dovea Kunth
- †1. *tectorum* Mast.—P.E.; Bethelsdorp.
- 2. *microcarpa* Kth. (= Schlechter 10502 and 10503, so named in Herb. Berol., but this is not identical with *D. ebracteata* Kth., under which Masters doubtfully placed it as a synonym).—Humewood, T.V.P. 3347, 618, 1104; P.E., T.V.P. 2546.
- †3. **racemosa* Mast.—Witteklip.

Elegia L.
- †1. *propinqua* Kth.—Witteklip.
- †2. *squamosa* Mast.—Van Stadens; Humewood; P.E.
- 3. *sp.* (close to *E. obtusiflora* Mast.).—Walmer, T.V.P. 2360.

Lamprocaulos Mast.
- 1. *sp.*—Van Stadens, T.V.P. 900.

Leptocarpus R. Br.
- †1. *incurvatus* Thunb.—Walmer.
- †‡2. **paniculatus* Mast.—Zwartkops R.

Thamnochortus Berg
- †1. *fruticosus* Berg.—Bethelsdorp; Humewood.
- †2. *argenteus* Kth.—Thornhill; Van Stadens.
- 3. *sp.*—Redhouse, T.V.P. 487; P.E. Valley, T.V.P. 2101 ♀); Earn Cliff, near P.E., Galpin 6391 (♂).

Hypolaena R. Br.
- 1. *sp.* (♂).—P.E., W.K. 310; Humewood, T.V.P. 1102.

Hypodiscus Nees
- 1. *striatus* Kth.—Elands River.
- 2. **synchroolepis* Mast.—Van Stadens.
- †3. **alboaristatus* Mast.—Van Stadens.

Cannomois Beauv.
- 1. *cephalotes* Beauv.—Van Stadens.

Not identified.

P.E., Dec., T.V.P. 1154; P.E., Sept., T.V.P. 2130; P.E., Oct., W.K. 1074.

XYRIDACEAE.

Xyris L.
- †1. **capensis* Thunb.—Van Stadens (*teste* Ecklon).

COMMELINACEAE.

Commelina L.
- ‡1. *benghalensis* Linn.—Uit., Jan.; Redhouse, Oct.
- †‡2. *africana* Linn.—P.E.; Redhouse, Sept.; Despatch, May; on hills of Addo, E. and Z. 441.
- ‡3. *eckloniana* Kth.—Uit., Dec.

Cyanotis D. Don
- ‡1. *nodiflora* Kunth—P.E.; Redhouse, Dec.; Uit., Jan.; hills by the Sunday and Zwartkops Rs., Nov., E. and Z. 610.

JUNCACEAE.

JUNCUS L.

†‡1. *maritimus* Lam.—Van Stadens R.; ? Redhouse, Dec., T.V.P., 2363.

†2. **acutus* L.—Near Zwartkops R.

†‡3. **punctorius* L.—Uit.

†‡4. *oxycarpus* E. Mey.—Bethelsdorp, Jan.

‡5. **rostratus* Buch.—Zwartkops R.

6. *diaphanus* Buch.—Springfields, Nov.

†7. *bufonius* L., var. *genuinus*, *forma fasciculatus* Buch.—Redhouse; Walmer, Oct.

8. **singularis* Steud.—Van Stadens Mts.; Bethelsdorp.

†9. *dregeanus* Kth.—Between Van Stadens Mts. and Bethelsdorp; Zwartkops R. Var. *conglomeratus* Buch.—Frames Drift, Feb.

10. *sonderianus* Buch.—Walmer, Oct.; P.E., Aug.

†‡11. *capensis* Thunb.—Uit. Var. *Ecklonii* Buch.—Van Stadens, Dec.

†‡12. *lomatophyllus* Spreng.—Zuurberg, Mar.

PRIONIUM E. Mey.

†1. *Palmita* E. Mey.—Van Stadens R., MacOwan 2089.

HAEMODORACEAE.

WACHENDORFIA L.

†1. *thyrsiflora* L.—Elands R., Dec.; Van Stadens Mts., Dec.

2. *paniculata* L.—Bethelsdorp, Nov.

LANARIA Ait. (Perhaps better placed under AMARYLLIDACEAE.)

1. *plumosa* Ait.—Bethelsdorp, Oct., Nov.; near Van Stadens Mts., Dec.; Leadmine R.

SANSEVIERIA Thunb. (Better placed amongst LILIACEAE near DRACAENA).

‡1. *thyrsiflora* Thunb.—Redhouse, Dec.; between the Zwartkops and Bushmans Rs., Dec., E. and Z. 612, common in the Addo Bush.

2. **aethiopica* Thunb. (wrongly named *S. zeylanica* Willd. in "Flora Capensis," VI, 5).—Uit.

CYANELLA L. (Perhaps better placed under AMARYLLIDACEAE.)

†1. *capensis* Linn.—Redhouse, Oct.

2. *lutea*, L.—Near the Zwartkops R., Nov.

AMARYLLIDACEAE.

FORBESIA Ecklon = CURCULIGO (see monograph by Nel in *Engl. Bot. Jahrb.*, Vol. LI).

(The material at my disposal is hardly sufficient to determine the species distinguished by Nel.)

†‡1. *plicata* (Ait.) Nel = *C. plicata* Ait.—Humewood and Emerald Hill.

NOTE.—T.V.P. 2700 (Donkin Reserve, P.E.) comes closest to *Forbesia plicata* (Ait.) Nel in *Engl. Bot. Jahrb.*, LI, p. 290, but the corm is without bristles.

Ianthe Salisb.

†1. *aquatica* (L. f.) Willd.—In swampy places left side of Cape Road, P.E., Nov.
†2. *stellata* (L. f.) Willd.—Redhouse, Aug.
3. *trifurcillata* Nel—P.E. Valley, Apr.; Humewood, May; Redhouse, Apr.; Emerald Hill; Despatch, June; Zuurberg, Mar.

Hypoxis Linn.

‡1. *Kraussiana* Buch.—Between Van Stadens and Bethelsdorp; P.E., Jan.
‡2. *argentea* Harv.—Near Uit., 250 ft., Apr., Schlechter 2492.
3. *Ludwigii* Bak.—Emerald Hill, Mar.
4. *stellipilis* Ker—Redhouse, Aug.; P.E., Oct.; on Karroo-like hills near the Zwartkops R., Oct., E. and Z. 1063.
5. **obliqua* Jacq.—Van Stadens, Burchell 4745 (*ex* Nel *l.c.* 309).
6. *Zeyheri*, Bak.—P.E., Jan.; near Uit., Ecklon, Drege 4139 (*ex* Nel, *l.c.*, 308).
‡7. *villosa* Linn. f.—Bethelsdorp, Nov.
‡8. *rigidula* Bak.—Van Stadens, Oct.
‡9. *Rooperi*, Moore—Zuurberg, Oct.
10. *sp.*—P.E., Jan., W.K. 267.
11. *sp.*—P.E., Mar., T.V.P. 3395. This is nearest *H. angustifolia*, Lam., but has longer stamens than the type.

Hessea Herb.

1. **gemmata* Benth.—Between Coega R. and Sundays R.
2. **crispa* Kunth—Addo (*teste* Ecklon).

Gethyllis L.

†1. *spiralis* Linn. f.—P.E., May; Redhouse.

Apodolirion Bak.

1. *MacOwani* Bak.—Algoa Bay and Coega R.

Crinum L.

1. *lineare* Linn. f.—Redhouse; Bethelsdorp, Feb.; P.E., Oct.
2. ? *variabilis* Herb.—Perseverance. (Material insufficient.)
3. *sp.*—Van Stadens, Mar., T.V.P. 1982.

Ammocharis Herb.

†‡1. **falcata* Herb.—Coega R.

Brunsvigia Heist.

‡1. *Josephinae* Gawl.—Frames Drift; Schoenmaakers Kop; Emerald Hill, Mar.; Zuurberg, May.
2. *minor* Lindl.—Redhouse, Mar.; Uit. div., E. and Z.

Note.—Zuurberg, Mar., F.H.H. 211, compare *B. sphaerocarpa* Bak.; Humewood, Apr., T.V.P. 2054, near *B. minor*. Ecklon (*l.c.*, p. 365) also quotes *B. uitenhagensis* Eckl. Herb. and *B. angustifolia* Eckl. Herb. Both of these have evidently remained manuscript names, and without reference to his specimens it is impossible to say whether they are distinct. Both were found on the hills near Uitenhage.

Nerine Herb.

1. ? *flexuosa* Herb.—Zuurberg, Apr., W. Tyson.
2. *undulata* Herb.—Mimosa, Aug.; Addo (*teste* Ecklon).
3. *Huttoni* Schonl.—Redhouse, Apr.

STRUMARIA Jacq.

1. *undulata* Jacq.—Zwartkops Hill, Mar.; Zuurberg, Mar.; near Uit., Apr., Schlechter 2571.

CYRTANTHUS Ait.

1. *stadensis* Schonl.—P.E., Jan.; Van Stadens, Mar.
2. *Dregei* Schonl.—P.E.
‡3. *obliquus* DC.—Bethelsdorp, Dec.
4. **parviflorus* Bak.—P.E.
5. *spiralis* Burch.—Redhouse, Dec.; burnt places, P.E., hills near Uit. (*teste* Ecklon).
†‡6. *angustifolius* Ait.—Redhouse, Feb.; P.E., July.
7. *uniflorus* Gawl.—Near Van Stadens R.
8. **vittatus* Desf.—Hills near Uit. (*teste* Ecklon).
‡9. *sanguineus* Hook.—Emerald Hill, Mar.
10. *n. sp.*—Redhouse, Feb., T.V.P. 452.

HAEMANTHUS L.

‡1. *puniceus* Bak.—Zwartkops R. mouth, Mar.
‡2. *magnificus* Herb.—Humewood, Jan.
‡3. *albiflos* Jacq.—Redhouse, Aug.
4. **incarnatus* Burch.—Kraggakamma.
5. *? tigrinus* Jacq.—P.E., May, J.L.D. 118, Feb., W.K. 282; Uit., Mar., E. and Z.
6. **hyalocarpus* Jacq.—Uit. dist. (*teste* Ecklon).
7. *sp.*—Redhouse, Feb.; Frames Drift; P.E. Valley, T.V.P. 489. Evidently allied to *H. tigrinus*, also to *H. sanguineus* Jacq.

Ecklon (*l.c.*, p. 365) also mentions *H. pubescens* Jacq. as having been found by him on the hills near Uitenhage.

BUPHANE Herb.

‡1. *disticha* Herb.—Redhouse, Dec.; P.E., Jan.

LILIACEAE.

ASPARAGUS L.

1. *exuvialis* Burch.—Redhouse, Feb.
2. **virgatus* Bak.—Van Stadens Hoogte, Dec.
3. *subulatus* Thunb.—Aloes, Dec.; near the Zwartkops R., Z. 250.
†4. *capensis* L.—P.E., June.
5. *Burchellii* Bak.—Near Zwartkops R., June, Z. 10.
6. *stipulaceus* Lam.—Redhouse, July. Var. *spinescens*.—Uit., July.
†7. *africanus* Lam.—On the banks of the Zwartkops R., Z. 178, 236.
8. *striatus* Thunb., var. *linearifolius*.—Uit., Jan.; Aloes, Dec.; Redhouse, Dec.
9. *racemosus* Willd.—Redhouse, Feb.; Van Stadens, Sept.; P.E. Valley, Nov.; Uit., Apr. (var. *tetragonus* Bak.).
10. *sarmentosus* L.—P.E., Feb.; near the Zwartkops R., Dec., E. and Z. 1061.
11. *Kraussii* Bak.—Baakens R. Valley, Nov.
†12. *medeoloides* Thunb.—Redhouse, Aug.; Uit., July, Z. 972; Zuurberg, Mar.

BEHNIA Didrichs
1. *reticulata* Didrichs—Redhouse, Mar.

DRACAENA Vand.
1. *hookeriana* K. Koch—Van Stadens R.

KNIPHOFIA Moench
†1. *aloides* Moench.—Zuurberg, Mar.
2. *Patersoniae* Schonl., n. sp. MS.—Bethelsdorp and Frames Drift, Apr., T.V.P. 669.

GASTERIA Duval
1. *Beckeri* Schonl.—Rocklands; Uit., Mar.; P.E., Jan.
2. *nigricans* Haw.—Redhouse, Aug. Var. *fasciata* Bak.—Redhouse, Sept.
3. *variolosa* Bak.—Cradock Place, P.E., Sept., Galpin 7101.
4. **colubrina* N. E. Br.—Uit. div.
5. *maculata* (Thunb.) Haw., var. *dregeana* Berg.—P.E., Jan., Drege 4182.
‡6. *Croucheri* (Hook. f.) Bak.—Humewood, Nov.; P.E., Nov.

ALOE L.
‡1. **Cooperi* Bak.—P.E. div., between Drostdy Farm and the Leadmine.
2. *micracantha* Haw.—Frames Drift, Feb.; Redhouse, Mar.
3. *humilis* Mill.—Redhouse, Aug.; P.E., Aug.
4. *striata* Haw.—Redhouse, Aug.; Uit., Z. 17.
5. *saponaria* Haw.—Springfields, Mar.; P.E., Jan.
6. *obscura* Mill.—Koega-Kamma's Kloof, May, Z. 4177; between Coega and Sundays Rs., Sept., Z. 15.
7. *laxiflora* N. E. Br.—Kamaehs, July.
8. *ciliaris* Haw., var. *Tidmarshii* Schonl.—Zuurberg, Mar.; Baakens R. Valley, Jan.
9. *tenuior* Haw.—Zuurberg, E. and Z. 1.
10. *striatula* Haw.—Redhouse, July; P.E., July.
11. *stans* Berg—Stony places near Bethelsdorp, Drege 4179.
12. *lineata* Haw.—Redhouse, Sept.
13. *microstigma* Salm-Dyck—Addo Bush.
14. *pluridens* Haw.—Redhouse, Aug.
15. *africana* Mill.—Redhouse, July.
16. *n. sp.*—Bethelsdorp, Jan., Zeyher in Herb., Alb. Mus.

HAWORTHIA Duval
1. *albanensis* Schonl.—Zuurberg, Mar.
2. *subfasciata* Bak.—Uit., Aug.; Despatch, Nov.
3. *fasciata* Haw.—Bethelsdorp, Jan.; near the Zwartkops R., Z. 4187, 1055, 29.
4. *attenuata* Haw.—P.E., Mar.
5. *cymbiformis* Haw., var.—Walmer, Aug.
6. *planifolia* Haw.—P.E., July.
7. *altilinea* Haw.—Redhouse, Dec., Jan.; Zwartkops R., Z. 4189, 25.
8. *vittata* Bak.—Redhouse, Nov., Jan.
9. **xiphiophylla* Bak.—Uit. div.

Bulbine L.

1. *caulescens* L.—Redhouse, Nov.; New Brighton, Apr.; P.E., Jan., Oct.; Zuurberg.
2. *rostrata* Haw.—Redhouse, Aug.
3. *filifolia* Bak.—Redhouse.
†4. *asphodeloides* L.—Uit., Apr.; Zuurberg, Mar.
5. **flexicaulis* Bak.—Hills by the Zwartkops R.
6. *narcissifolia* Salm-Dyck.—Redhouse, May.
7. **mesembryanthemoides* Haw.—Near the Zwartkops R.
8. *latifolia* R. et S.—Redhouse, Oct.
9. *Patersoniae* Schonl. Ms.—Redhouse, Sept., T.V.P. 1165.

Schizobasis Bak.

1. *intricata* Bak.—Redhouse, Feb.; Zuurberg, Mar.
2. *sp.*—Uit., Z. 286.

Eriospermum Jacq.

1. *Dregii* Schonl.—Zwartkops R., Mar.; North End, P.E.
2. *Bellendeni* Sw.—Zwartkops, Feb.; P.E., Feb.; near Bethelsdorp, Mar., E. and Z. 739; Redhouse, May.
†3. *pubescens* Jacq.—Redhouse, May and Mar.
4. **latifolium* Jacq.—Uit.

Anthericum L.

1. **angulicaule* Bak.—Sandy hills by the Zwartkops R.
2. **triflorum* Ait., var. *minor*.—By the Zwartkops R.
3. *pudicum* Bak.—Redhouse, Nov., Oct.
†4. *elongatum* Willd.—Zwartkops R., Sept.; on sand-hills near Uit.; Zuurberg.
5. *MacOwani* Bak.—P.E., Oct., Nov.
†6. *revolutum* L.—P.E., Oct.
7. *falcatum* L.—P.E., Oct.
†8. *longifolium* Jacq.—Redhouse, Sept.
†9. *hirsutum* Thunb.—P.E., Oct.
†10. *Gerrardi* Bak.—P.E., Oct.; Redhouse, Oct.
†11. *ciliatum* L.—New Brighton, Sept.
12. *sp.*—Uit., Oct., E. and Z. in Herb., Alb. Mus.

Chlorophytum Ker

1. *crispum* Bak.—Redhouse, Dec., Feb.
2. *elatum* R. Br.—Frames Drift, Feb.; Springfields, Mar.; Uit., Jan.; Van Stadens, May.
†3. *comosum* Bak.—Redhouse, Mar.

Caesia R. Br.

1. *sp.*—Van Stadens, Nov., T.V.P. 869.

Agapanthus L'Herit.

†1. *umbellatus* L'Herit.—Bethelsdorp, Dec.; Uit., Oct., E. and Z. 1062.

Tulbaghia L.

†1. *acutiloba* Harv.—P.E., Dec., Nov.
2. *cepacea* L.—Near Zwartkops R., Oct., E. and Z. 645; Uit.
3. *violacea* Harv.—P.E., June; Redhouse, Feb.; Uit., May.

Allium Linn.

1. *dregeanum* Kth.—Redhouse, Nov.
2. §*triquetrum* L.—P.E., Oct., Nov.

MASSONIA Thunb.
1. *hirsuta* Link—Redhouse, June, July; P.E., July.
2. **orientalis* Bak.—Sand-dunes at P.E.
3. **muricata* Ker—Near the Zwartkops R., 20 to 200 ft. (*teste* Ecklon).

POLYXENA Kunth
1. *ensifolia* Schonl.—P.E.; Redhouse, May; Uit., Apr., Schlechter 2600.

NEOPATERSONIA Schonl.
1. *uitenhagensis* Schonl.—Redhouse.

LACHENALIA Jacq.
1. *algoensis* Schonl.—Redhouse, Aug.; P.E.
†2. *orchioides* Ait.—P.E.; Redhouse, Aug.; Perseverance.
3. **pustulata* Jacq.—Near the Zwartkops R.

DRIMIA Jacq.
†1. **media* Jacq.—Near Kragga Kamma.
2. **pusilla* Jacq.—Hills near Uit. (*teste* Ecklon).
3. *haworthioides* Bak.—Redhouse, Jan., Feb.
4. *Burchellii* Bak.—Frames Drift, Mar.
5. * ? *macrantha* Bak.—Van Stadens R., below 200 ft.
6. *sp.*—Redhouse, Dec., T.V.P. 2664*a*. (Probably the plant which Baker called *D. ? Bolusii.*)

LITANTHUS Harv.
1. *pusillus* Harv.—Thornhill, July.

DIPCADI Medic.
1. *megalanthum* Zahlbr.—P.E., Feb., Dec.
2. *ciliare* Bak.—Redhouse, Sept.
3. *viride* Moench—Redhouse, Dec.

ALBUCA L.
1. *nana* Schonl.—Redhouse, Nov.
2. *Dalyae* Bak.—Coerney, Oct.; P.E., Nov.
3. *Schonlandi* Bak.—Redhouse, Oct.
4. *longifolia* Bak.—Redhouse, Oct.
5. *Patersoniae* Schonl.—Zwartkops, Feb.; Redhouse, Feb., Aug.
6. *circinata* Bak.—Redhouse, Dec.
7. *exuviata* Bak.—Redhouse, Sept., Oct.
8. *minor* L., var. *juncifolia* Schonl.—Walmer, Oct.
9. *Cooperi* Bak.—Humewood, Oct.; P.E., Aug.
10. *trichophylla* Bak.—Redhouse, Nov.
11. **corymbosa* Bak.—P.E.
12. *fastigiata* Dryand.—Redhouse, Oct.; Walmer, Oct.
13. *caudata* Jacq.—Redhouse, Oct.; ? Emerald Hill, Aug., T.V.P. 2554; P.E., Aug.
14. *polyphylla* Bak., var. *major* Schonl.—Redhouse, Sept., Oct.
15. *tortuosa* Bak.—P.E., May; Walmer, Oct.
16. *aurea* Jacq.—Redhouse, Nov.
17. *setosa* Jacq.—P.E., Feb.
18. *tenuifolia* Bak.—Redhouse, Nov.
19. *sp.*—P.E., Aug., J.L.D.; P.E. Valley, Sept., T.V.P. 2579.

URGINEA Steinh.

1. *Patersoniae* Schonl. Ms.—P.E., Nov., J.L.D. 3122; Redhouse, Nov., Oct., T.V.P. 2175; Aloes, Apr., J.L.D. 3122.
2. *vittata* Schonl. Ms.—Redhouse, Nov., T.V.P. 2648.
3. *filifolia* Steinh.—Van Stadens, Nov.
4. *exuviata* Steinh.—Humewood, Oct.; P.E., Oct.

†5. *? altissima* Bak.—Zuurberg, Dec.

6. *sp.* (closely allied to *U. ciliata* Bak.).—Redhouse, Mar., T.V.P. 976.

Ecklon (*l.c.* p. 364) points out that already Thunberg probably confounded a new species which the former described as *Drimia uitenhagensis* (found by him near Addo, and near the Zwartkops and Sundays Rivers) with *D. altissima* Ker. This is evidently the plant enumerated above as *U. altissima* Bak. There appears to be, however, even another species different from *U. altissima* though close to it, which was collected on the P.E. golf-course by Mr. F. H. Holland. I have these plants under cultivation and hope to be able to report on them later when the descriptions of the other new species mentioned in this paper will be published.

VELTHEIMIA Gled.

1. *viridifolia* Jacq.—Bethelsdorp, Sept.

EUCOMIS L'Herit.

1. *undulata* Ait.—Bethelsdorp, Sept.

SCILLA Linn.

1. *lanceaefolia* Bak.—Addo (*teste* Ecklon).
2. *Nelsoni* Bak.—Redhouse, Mar.
3. *Ludwigii* Bak.—Redhouse, Oct.; sandy places near the Zwartkops R.
4. *prasina* Bak.—Redhouse, Dec.
5. *concolor* Bak.—Kamaehs, Nov.
6. *tricolor* Bak.—? P.E., Dec., J.L.D. 138.
7. *floribunda* Bak. (= *Sc. princeps* Bak.).—P.E., Dec
8. *ebracteata* Schonl. Ms.—Redhouse, Oct.
9. *sp.*—Redhouse, Jan., T.V.P. 2678 (near *S. subsecunda* Bak.

NOTE.—Ecklon (*l.c.*, p. 364) describes a new species of *Drimia* as *D. nitida*, which would be now placed under *Scilla*, found in woods at Addo. Without reference to his specimens it is difficult to decide whether it is identical with any other described species. According to him it is distinguished from *D. lanceaefolia* Ker, by green and not spotted leaves, by larger flowers and somewhat shorter flower stalks.

ORNITHOGALUM L.

1. *Patersoniae* Schonl. Ms.—Redhouse, Nov.; Coega, Nov., F.A.R. 2118; P.E., Dec., W.K. 266; Redhouse, Oct., F.A.R. 118.

†2. *thyrsoides* Jacq.—Redhouse, Dec.; P.E., Nov.; Bethelsdorp, Nov.

3. **Zeyheri* Bak.—Near the Zwartkops R.
4. *tenellum* Jacq.—Redhouse, Feb.
5. *flavovirens* Bak.—Redhouse, Nov.

ORNITHOGALUM L.—*continued.*

6. *bolusianum* Bak.—Coerney, Oct.; Redhouse, Oct.
7. *niveum* Ait.—? Redhouse, Dec., T.V.P. 389.
8. *subulatum* Bak.—Redhouse, Feb.; P.E., Nov.
9. *comptum* Bak.—Redhouse, Nov.; P.E., Dec.
10. *humifusum* Bak.—Redhouse, Nov.
11. *Eckloni* Schlecht.—Redhouse, Dec.; Frames Drift, Feb.
12. *longebracteatum* Jacq.—P.E. Valley and Redhouse, Nov., Apr.
13. *caudatum* Bak.—Redhouse, Oct.
14. *sp.* (near *O. Zeyheri*, but apparently distinct).—Redhouse, Oct., F.A.R. 118.

ANDROCYMBIUM Willd.

†1. *leucanthum* Willd.—Addo (also ? T.V.P. 1148, Schoenmaakers Kop, Aug.).
2. *eucomoides* Willd.—Banks of Zwartkops and Sundays Rs.
3. *melanthioides* Willd.—Hills near Uit.; Redhouse, Aug.
4. *longipes* Bak.—Thornhill, July.
5. *albanense* Schonl.—Redhouse, June, Aug.

WURMBEA Thunb.

†1. *capensis* Thunb.—Walmer, Oct., T.V P 818 (var. *marginata*), P.E., Sept., J.L.D. 269 (var. *purpurea*).

DIPIDAX Salisb.

†1. *triquetra* Bak.—P.E., Aug.

ORNITHOGLOSSUM Salisb.

†1. *glaucum* Salisb.—Redhouse, Nov.

NEODREGEA C. H. Wright

1. *Glassii* C. H. Wright—P.E., Aug., May.

DIOSCOREACEAE.

DIOSCOREA L.

1. *sp.*—Kamaehs, Nov., T.V.P. 1032 (no flowers).

TESTUDINARIA Salisb.

‡1. *elephantipes* Burch.—P.E., Mar.; Sundays R., Mar.
‡2. *sylvatica* Kth.—Humewood, Apr.; P.E., Aug.; Redhouse, Aug.; Krakakamma under 500 ft.

IRIDACEAE.

MORAEA L.

‡1. *spathacea* Ker—Bethelsdorp, June; P.E., July.
†2. *viscaria* Ker—Frames Drift, Nov.
3. *polyanthos* Thunb.—Lorie R., Aug.; Uit., Aug.
4. *polystachya* Ker—P.E., Sept., Oct.; Bethelsdorp, Sept., Z. 16.
†5. **ramosa* Ker—Plains under the Mts. of Winterhoek; Van Stadens R.; by the hills near P.E. (*teste* Ecklon).
6. *setacea* Ker—Redhouse, Nov.; P.E., Aug., Nov.
†7. **tripetala* Ker—Plains under the Mts. of Winterhoek; Van Stadens R.; by the hills near P.E. (*teste* Ecklon).
‡8. *iridioides* L.—Elands R., Dec.; Springfields, Nov.
9. *bicolor* Spae—P.E., Aug.
10. *sp.*—P.E., Nov., J.L.D. 298; near Uit., Z. 13; Bethelsdorp, Nov., T.V.P. 382; Uit., Sept., 1164.

HOMERIA Vent.

†1. *collina* Vent.—Redhouse, Sept.; Walmer, Aug. Var. *ochroleuca* Salisb.—Banks of Zwartkops R. and Sundays R. (*teste* Ecklon).

FERRARIA L.

1. §*antherosa* Ker—P.E., Aug., J.L.D. 153.

HEXAGLOTTIS Vent.

†1. *longifolia* Vent.—Kamaehs, Nov.; P.E., Jan.; Van Stadens Hoogte.

SYRINGODEA Hook. fil.

1. *Flanagani* Bak.—Redhouse, June.

ROMULEA Maratti

†1. **bulbocodioides* Bak.—Uit. dist. (*teste* Ecklon).
2. **filifolia* Eckl.—Uit.
†3. *chloroleuca* Bak.—Walmer, Aug.
†‡4. *rosea* Eckl., var. *parviflora* Bak.—P.E., Aug., Sept.; Humewood, July.
5. *sp.*—P.E., Sept., T.V.P. 2138; Van Stadens, Sept., T.V.P. 755; Walmer; P.E., Miss Jordan 8.

BOBARTIA Ker

1. *Burchellii* Bak.—Baakens R. valley, Feb.
†2. *spathacea* Ker—Bethelsdorp, Nov.

ARISTEA Soland.

‡1. *anceps* Eckl.—Redhouse, Dec.
‡2. *schizolaena* Harv.—P.E., Oct.
‡3. *paniculata* Bak.—Van Stadens, Dec.
4. *pusilla* Ker—Bethelsdorp, Sept.; P.E., Aug.
5. *spiralis* Ker—Bulkriver, P.E., Oct.; Elands R., Dec.; in the channel of the Zwartkops R., Sept., Z. 235.
‡6. *Eckloni* Bak.—Zwartkops R. and Van Stadensberg, Ecklon 235, 4054.

HESPERANTHA Ker

†1. *falcata* Ker—P.E., Sept.
†‡2. *radiata* Ker—Redhouse, Sept.
3. *angusta* Ker—Redhouse, Aug.; P.E., Nov.; Loerie R., near P.E., Nov.; Van Stadens, Sept.

GEISSORHIZA Ker

1. *Patersoniae* L.Bol.—P.E., Sept., J.L.D. 257, ? 165; Redhouse, Oct., T.V.P. 47.
2. **setacea* Ker—Near the Zwartkops R. (*teste* Ecklon).
3. *secunda* Ker—Bethelsdorp, Sept.; Walmer, Oct.; P.E., Sept.; Van Stadens.
4. **imbricata* Ker—Hills near Uit. (*teste* Ecklon).
5. *bracteata* Klatt—P.E., Sept.
6. **grandis* Hook.—P.E.
7. . *sp.*—Uit., Sept., E. and Z. in Herb., Alb. Mus.

IXIA L.

†1. *polystachya* L.—Van Stadens, Oct.

DIERAMA K. Koch

‡1. *pendula* Bak.—Baakens R. valley, Jan.; Zuurberg.

‡2. **pulcherrima* Bak.—Uit.

MICRANTHUS Pers.

†1. *plantagineus* Eckl.—Near Galgebosch; Van Stadens R.

FREESIA Klatt

1. *refracta* Klatt—Redhouse, Aug.; Bethelsdorp, Sept.; P.E., Oct. Var. *odorata* Klatt—Between Zwartkops R. and Sundays R., Oct., E. and Z. 286.

WATSONIA Miller

1. *angusta* Ker—P.E., Nov.; near the Van Stadens R.

†‡2. *Meriana* Miller—Van Stadens, Nov.; Baakens R. valley, Jan.; P.E., July; on stony hills by Bethelsdorp, Jan., E. and Z. 182, 183.

BABIANA Ker

1. *coerulescens* Eckl.—(Placed by Baker wrongly under *B. plicata*).—Redhouse, Aug., T.V.P. 39; P.E., Aug., J.L.D. 76; Uit., Oct., Miss Jordan 66; P.E., Aug.; near the Zwartkops R., Sept., E. and Z. 159.

Ecklon (*l.c.*, p. 366) also mentions *B. tubata* Willd. (found on the plains under the Winterhoek Mts.). I do not know whether this is *B. tubata* Sweet.

MELASPHAERULA Ker

†1. *graminea* Ker—Hills near Uit.; Redhouse, Sept.; Van Stadens, Sept.

SPARAXIS Ker

1. **fragrans* Ker—Banks of Zwartkops R. and Sundays R. (*teste* Ecklon).

TRITONIA Ker

1. *dubia* Eckl.—Redhouse, Aug.; P.E., Aug.; Uit., Oct.; near the mouth of the Zwartkops R., Ecklon 141, Nov., E. and Z. 3971.

‡2. *lineata* Ker—Redhouse, Aug.; P.E., Oct.; near the Zwartkops R., Ecklon 141, Nov., E. and Z. 3971.

3. **Wilsoni* Bak.—P.E.

‡4. *rosea* Klatt—P.E., Nov.

‡5. **laxifolia* Benth.—Between Zwartkops R. and Sundays R.

6. *securigera* Ker—Sydenham, Sept.; Redhouse, Mar.; near Uit., Apr., Schlechter 2510; Zuurberg, Mar.

Ecklon (*l.c.*, p. 366) mentions also *T. rosea* R. Br. (found near Addo) and *T. odorata* Eckl. Herb. (found on the hills near Uitenhage). I have no means of deciding whether these are identical with any of the species mentioned above.

ACIDANTHERA Hochst.

1. **platypetala* Bak.—Galgebosch.

GLADIOLUS L.

†1. *grandis* Thunb.—Van Stadens and Bethelsdorp, Oct.
†2. **tristis* Linn.—Foot of Van Stadensberg, below 1000 ft.
†3. *maculatus* Sw. (= *recurvus* Linn).—Zuurberg, May; Walmer, Mar., Aug.; Bethelsdorp, June: Redhouse, Aug.
†4. **gracilis* Jacq.—Van Stadensberg.
†5. *tenellus* Jacq.—Walmer, Aug.
6. *floribundus* Jacq.—P.E., Jan. (MacOwan 2062, from Van Stadens R., is mentioned in the "Flora Capensis" under this species, but Mr. F. Bolus names it *G. undulatus*.)
7. *Milleri* Ker—Van Stadens R., Apr., Dec.; P.E., Oct.; near Coega.
8. *undulatus* De la Roche—Redhouse, Sept., Oct., Nov.; Uit., Nov.; P.E., Nov.
9. *MacOwani* Bak., var. *brevituba*.—Zuurberg, Mar.
‡10. *edulis* Burch.—P.E., Dec.; Redhouse, Oct.
11. *permeabilis* Bak.—Bethelsdorp, Oct.; Redhouse, Aug.; P.E., Nov.; Frames Drift, Mar.
12. *sp.*—P.E., Oct., W.K. 124.

Ecklon (*l.c.*, p. 366) also mentions *G. pendulus* Mund., from plains under the Winterhoek, but the identity of this species appears to be unknown. The same applies to his *Hebea viperata* (which he says is identical with *Gladiolus viperatus* Ker), found by him near the Zwartkops River.

ANTHOLYZA L.

‡1. *caffra* Ker—Van Stadens, Nov.
2. *intermedia* Bak.—Bethelsdorp, Sept., T.V.P. 121 (no leaves, but has the perianth marked as in *A. intermedia* Bak.); Van Stadens Hoogte.
†3. *aethiopica* L.—Redhouse, Apr.
†4. *revoluta* Burm.—Bethelsdorp, June.
†5. *Lucidor* L. f.—Van Stadensberg, Z. 604.
†6. *nervosa* Thunb.—Bethelsdorp, Sept.; Redhouse, Feb.; Van Stadens Mts., Dec.

MUSACEAE.

STRELITZIA Ait.

1. *Reginae* Banks—Rocky slopes near Uit.
2. *parvifolia* Dryand.—Uit. Mts., Sept.

CANNACEAE.

CANNA L.

1. §*indica* L.—Naturalized at Van Stadens Pass.

ORCHIDACEAE.

ACROLOPHIA Pfitz.

1. *micrantha* Schlechter—Redhouse, Oct., Nov.; near Zwartkops R.
†2. **cochlearis* Schlechter—Van Stadens Mts.; ? P.E., Oct., J.L.D. 97, 98.
†3. *tristis* Schlechter—P.E., Nov., Dec.; Redhouse, Nov.

EULOPHIA R. Br.
1. **nutans* Sond.—Van Stadens Mts.
‡2. **purpurascens* Rolfe—Van Stadens Mts.
3. **ovatipetala* Rolfe—Emerald Hill.
‡4. *hians* Spreng.—Van Stadens, Sept.; Frames Drift, Nov.
‡5. *barbata* Spreng.—P.E.; Redhouse, Nov.; between Van Stadensberg and Bethelsdorp; Uit.
‡6. *aculeata* Spreng.—Elands R., Dec.
7. *Huttonii* Rolfe—Zwartkops R.

LISSOCHILUS R. Br.
1. *platypetalus* Lindl.—Van Stadens, Sept.; Redhouse, Sept.
‡2. *aequalis* Lindl.—P.E., Feb., Oct.
‡3. **speciosus* R. Br.—Sandhills at Kraggakamma.
‡4. *arenarius* Lindl.—Redhouse, Oct., Nov.; P.E., Oct.

POLYSTACHYA Hook.
‡1. **pubescens* Reichb. *f.*—Van Stadens R. and around Kraggakamma.

ANGRAECUM Bory
‡1. *sacciferum* Lindl.—Kamaehs, Nov.
‡2. *pusillum* Lindl.—P.E., Aug.; Zuurberg, Aug.
‡3. **bicaudatum* Lindl.—Limestone hills near the mouth of the Zwartkops R.; ravines near Uit.

LISTROSTACHYS Reichb. f.
1. **arcuata* Reichb. f.—Limestone hills near the mouth of the Zwartkops R.; Uit.

MYSTACIDIUM Lindl.
‡1. *filicorne* Lindl.—Despatch, Dec.

BARTHOLINA R. Br.
†1. *pectinata* R. Br.—Walmer, Aug.; P.E.
2. *lindleyana* Reichb. *f.*—Uit.; sandy places at P.E.

HOLOTHRIX L. C. Rich.
†1. **exilis* Lindl.—Uit.
†2. *villosa* Lindl.—P.E., Oct.; Van Stadens, Nov.
†3. **squamulosa* Lindl.—P.E.
‡4. *lindleyana* Reichb. f.—Redhouse, Aug.; Bethelsdorp, Sept.
‡5. *orthoceras* Reichb. f.—P.E., Aug.
6. *Schlechteriana* Kränzl.—Redhouse, Nov.
7. **grandiflora* Reichb. f.—Uit.
8. *Burchellii* Reichb. f.—Redhouse, Sept., Oct.; P.E., Nov.
9. *Hallackii* Bol.—P.E., Dec.

HABENARIA Willd.
‡1. *arenaria* Lindl.—P.E., May; Kamaehs, June.
2. **anguiceps* Bol.—Van Stadens R.
‡3. *foliosa* Reichb. f.—P.E., Feb.; Emerald Hill.
4. *laevigata* Lindl.—Van Stadens, Sept.
5. *falcicornis* Bolus—Van Stadens, Mar.

BONATEA Willd.
‡1. *Boltoni* Bol.—P.E., Oct.; Redhouse, Sept.
2. *speciosa* Willd.—P.E., Oct.; Walmer, Nov.

SATYRIUM Sw.
1. *_retusum_ Lindl.—Sandy places at Algoa Bay.
‡2. _parviflorum_ Sw.—P.E., Oct., Nov.; Van Stadens, Sept.; Bethelsdorp, Sept.
‡3. ? _aphyllum_ Schlechter.—P.E.
4. _coriifolium_ Sw.—P.E., Aug.; Walmer, Sept.
†5. *_lupulinum_ Lindl.—Algoa Bay.
†6. _Hallackii_ Bol.—Humewood, Jan.; P.E., Oct., Nov.
‡7. *_cristatum_ Sond.—P.E.
8. _maculatum_ Burch.—Van Stadens, Nov.; Redhouse, Nov.; P.E., Nov.
9. _membranaceum_ Sw.—Bethelsdorp, Sept.; Van Stadens, Sept.; P.E., Nov.
10. _princeps_ Bolus—Humewood, Oct.; P.E., Oct.

MONADENIA Lindl.
1. _micrantha_ Lindl.—P.E., Oct., Nov.; Walmer, Oct.; Van Stadens, Aug.
2. _brevicornis_ Lindl.—Walmer, Nov.

HERSCHELIA Lindl.
†1. _venusta_ Kränzl.—P.E., Feb., Mar.; Van Stadens.

PENTHEA Lindl.
1. _filicornis_ Lindl.—Zuurberg, Nov. (odd sepal unspotted).

DISA Berg
†1. *_tenella_ Sw.—Uit.
‡2. _chrysostachya_ Sw.—Walmer, Nov.; P.E., Oct., Nov.
3. *_Hallackii_ Rolfe—Wet places near P.E.
†4. _cornuta_ Sw.—Van Stadens, Sept.; P.E., Sept., Oct.; Kraggakamma.
‡5. *_crassicornis_ Lindl.—Uit.
‡6. _tripetaloides_ N. E. Br.—Van Stadens, Dec.
‡7. _sagittalis_ Swartz.—Bethelsdorp, Sept.
†8. *_racemosa_ Linn.—Near P.E.
9. _porrecta_ Sw.—Uit., Feb.; Zuurberg, Mar.

SCHIZODIUM Lindl.
†1. _rigidum_ Lindl.—Redhouse, July; P.E., Aug.

BROWNLEEA Harv.
‡1. _coerulea_ Harv.—Zuurberg, Mar.

CERATANDROPSIS Rolfe
1. _grandiflora_ Rolfe—Cape Road, 10 miles out of P.E., Nov.

CERATANDRA Eckl.
1. _chloroleuca_ Eckl.—Walmer, Nov.

PTERYGODIUM Sw.
1. _acutifolium_ Lindl.—P.E., Oct.
†2. _catholicum_ Sw.—P.E., Sept.
3. *_cruciferum_ Sond.—Near Bethelsdorp.

CORYCIUM Sw.
1. _carnosum_ Rolfe—Van Stadens, Nov.; Baakens R. valley, Oct.

DISPERIS Sw.
†1. _capensis_ Sw.—Bethelsdorp, Sept.; P.E., Aug.

DICOTYLEDONEAE.

ARCHICHLAMYDEAE (POLYPETALAE AND APETALAE).

PIPERACEAE.

PEPEROMIA Ruiz et Pav.
‡1. *reflexa* Dietr.—Springfields, Mar.

SALICINEAE.

SALIX L.
†1. *capensis* Thunb.—Elands R., Dec.; on the banks of the Zwartkops R., Z. 147.

MYRICACEAE.

MYRICA L.
†‡1. *aethiopica* L.—Walmer, Mar.; in channel of the Zwartkops R., Dec., Z. 128; Springfields, Jan.
†2. *quercifolia* L.—Humewood, July; Van Stadens Mts., July; on downs by P.E., Dec., Z. 749.
†3. *cordifolia* L.—Humewood, Apr.; P.E., Jan., Oct.
4. *serrata* Lam.—Van Stadens, Mar., June.
5. *sp.*—Van Stadens, July, E. and Z. in Herb., Alb. Mus.

URTICACEAE.

URTICA L.
†1. §*dioica* L., var.—P.E., May.
2. *Meyeri* Wedd.—Despatch, Oct., T.V.P. 3240.
3. **Burchellii* N. E. Br.—Uit. div., Zeyher.

FLEURYA Gaud.
1. **grossa* Wedd.—On old trees in the Uit. div.; Zuurberg Range.
2. *mitis* Wedd.—Galgebosch; Kraggakamma.

AUSTRALINA Gaud.
†1. ? *capensis* Wedd.—Redhouse, Nov., T.V.P. 3233; ? P.E. Valley, Aug., T.V.P. 1160.
2. **acuminata* Wedd.—Near Enon.

ULMACEAE.

CELTIS L.
†1. *rhamnifolia* Presl—Van Stadens, Sept.; Kraggakamma.

CHAETACME Planch et Harv.
1. *aristata* Planch.—Forest near Van Stadens R.; Galgebosch; Enon.

MORACEAE.

FICUS L.
1. *capensis* Thunb.—Springfields; Enon.
2. *Burtt-Davyi* Hutch.—Kraggakamma; P.E.; near Enon.

PROTEACEAE.

LEUCADENDRON R. Br.

†1. *salignum* R. Br.—Van Stadens Drift, Nov. ; Zwartkops, Feb.
2. *strictum* R. Br.—Van Stadens Mts., Z. 3650.
3. *eucalyptifolium* Buek—Van Stadens, May.
†4. *adscendens* R. Br.—Van Stadens, Nov. ; Bethelsdorp, Aug.: Zuurberg.
5. *concolor* R. Br.—Van Stadens Mts., Oct.

Ecklon (*l.c.*, p. 367) mentions having found *L. venorum* R.Br., on Van Stadens Mts.

PROTEA L.

†1. *Lepidocarpodendron* L.—Walmer ; Van Stadens Mts.
2. *neriifolia* R. Br.—Walmer, Aug. ; P.E., Dec. ; rocky places on the Van Stadens Mts., Oct.
3. *latifolia* R. Br.—Van Stadens Mts.
4. **compacta* R. Br.—Van Stadens Mts.
5. *longiflora* Lam.—Winterhoek and Van Stadens Mts.
†6. *mellifera* Thunb.—Springfields, Mar.
7. *Mundii* Klotzsch—Van Stadens R., June ; on the stony hills of the Van Stadens Mts., Oct.
8. *tenax* R. Br.—Bethelsdorp, Sept. ; Van Stadens Mts.
†9. *cynaroides* R. Br.—Van Stadens, Apr., Oct.

Ecklon (*l.c.*, p. 367) also mentions *P. mucronifolia* Salisb. (*P. odorata* Thunb.) and *P. revoluta* R. Br. as having been found by him on Van Stadens Mts.

LEUCOSPERMUM R. Br.

1. *attenuatum* R. Br.—Van Stadens, Sept. ; Zuurberg.

NIVENIA R. Br.

1. *reflexa* Phill. et Hutch.—Van Stadens, May.

LORANTHACEAE.

LORANTHUS L.

‡1. *elegans* Ch. et Schl. (= *L. oleaefolius* E. et Z., non Cham. et Schlecht. ; see Kew Bull., 1914, 362).—Despatch and Redhouse, July ; along Sundays and Zwartkops Rs., Z. 2283 ; Uit., June.

VISCUM L.

†‡1. *obscurum* Thunb.—Redhouse, Mar. ; P.E., July.
2. *rotundifolium* Thunb.—Uit., Sept. ; Redhouse, Feb., Nov. ; P.E., Aug. ; near the Zwartkops and Sundays Rs., July, Z. 244 (on *Rhus* and *Celastrus*) ; in the channel of the Zwartkops R., June, Z. 624 (on *Salix*).
3. *Crassulae* E. et Z.—Near Uit. (on *Portulacaria* and *Euphorbia polygona*).
4. *minimum* Harv.—Near P.E. (on *Euphorbia polygona*).
†5. *capense* Thunb.—Walmer, Aug. ; Redhouse, Nov. ; P.E., July (on *Rhus Krebsiana* Presl ?) ; Uit. dist., E. and Z. 2278.

SANTALACEAE.

THESIUM L.

1. **rigidum* Sond.—Uit. div.; Steinbok Flats, north of Winterhoeksberg; near Karreebosch.
2. *acutissimum* A. DC.—Redhouse; Van Stadens, May, Sept.
†3. *squarrosum* L.—Van Stadens, Sept.
4. *foliosum* A. DC.—Van Stadens, Dec.
5. *fruticosum* A. W. Hill—Zuurberg, Oct.
†6. *euphorbioides* L.—Uit. div.; Zwartkops R., Z. 3786.
†‡7. *triflorum* Thunb.—Redhouse, Dec.; near the Zwartkops R., Z. 50.
8. *scandens* E. Mey.—P.E., Jan.
†9. *galioides* A. DC.—P.E., Sept.
†10. *ericaefolium* A. DC.—Redhouse, Sept.
†11. *nigromontanum* Sond.—Humewood, Sept.
†12. *leptocaule* Sond.—Walmer, Aug.; Humewood, Apr.
†13. *commutatum* Sond.—Van Stadens Mts., Oct., E. and Z. 272.
†14. *virgatum* Lam.—Uit., Dec.; Schoenmaakers Kop, Apr.
†15. *strictum* Berg—Bethelsdorp, Jan.; Van Stadens, May.
16. *junceum* Bernh., var. *mammosum* A. W. Hill.—Walmer, Oct.
†17. *flexuosum* A. DC.—Walmer, July; Redhouse, Oct.; Gamtoos R., 150 ft., Nov., Schlechter 6081.
†18. *gnidiaceum* A. DC.—Addo, 1000 to 2000 ft.
19. **phyllostachyum* Sond.—Between P.E. and the Zwartkops R.
20. ? *rufescens* A. W. Hill—Aloes, Sept., J.L.D. 3043.
21. *sonderianum* Sch.—Redhouse, Aug.
†22. ? *micropogon* A. DC.—Redhouse, Oct., F. A. Rogers 131.
†23. **carinatum* A. DC.—Uit. div.; Winterhoek Mt., 2000 ft.
†24. *spicatum* Thunb.—Despatch, Oct.; P.E., Sept.
†25. **subnudum* Sond.—Van Stadensberg.
26. *Patersonae* A. W. Hill—Redhouse, June.

OSYRIS L.

†‡1. *abyssinica* Hochst. [= *compressa* (Berg.) DC.].—Baakens R. valley, May; Van Stadens Mts., Mar., E. and Z. 311.

RHOIOCARPUS A. DC.

1. *capensis* A. DC.—Redhouse, Aug.; amongst shrubs on banks of the Zwartkops R., June, Z. 6; Uit., 50 to 500 ft., Apr., E. and Z.

THESIDIUM Sond.

†1. **Thunbergii* Sond.—Strand near Cape Recife.

GRUBBIACEAE.

GRUBBIA Berg

1. **stricta* DC.—Mountains in the Uit. dist.

RAFFLESIACEAE.

CYTINUS Linn.

†1. *dioicus* Juss.—P.E., Sept.

POLYGONACEAE.

POLYGONUM L.

†1. *atraphaxoides* Thunb.—Humewood, Oct.; Van Stadens Mts.; hills and forest of Kraggakamma.
†‡2. §*aviculare* L.—Redhouse, Sept.
†3. §*Convolvulus* L.—Redhouse, Dec.
†‡4. *serrulatum* Lag.—Despatch, June; Zuurberg.
†‡5. *tomentosum* Willd.—Bethelsdorp, Nov.; P.E., Dec.; Uit., Jan.
6. *pedunculare* Wall.—Despatch, Oct.
7. *equisetiforme* DC.—Redhouse, June.

RUMEX L.

†1. §? *pulcher* L.—Springfields, Nov.
†2. *sagittatus* Thunb.—P.E. Valley, Nov.; banks of Zwartkops and Sundays Rs.
†‡3. §*Acetosella* L.—Redhouse, Oct.; Walmer, Oct.
4. *lativalvis* var. *acetosoides* Meisn.—Redhouse, Aug.
†5. *cordatus* Desf.—P.E.; near the Zwartkops R.
‡6. *ecklonianus* Meisn.—Redhouse, Aug.

Ecklon (*l.c.*, p. 367) quotes *R. lanceolatus* Thunb., as found by him near Addo, and *R. spathulatus* Thunb., found by him on the banks of the Zwartkops River. Both these species are imperfectly known.

EMEX Neck.

†‡1. *australis* Steinh.—Redhouse, Aug.

CHENOPODIACEAE.

CHENOPODIUM L.

†‡1. §*ambrosioides* L.—Redhouse, Mar.
†‡2. §*murale* L.—Redhouse, Mar.
3. §*Vulvaria* L.—Redhouse, Apr.
4. **mucronatum* Thunb. (an imperfectly known species).—Foot of the Winterhoek Mts. (Krause); near the Zwartkops R., 20 to 100 ft. (*teste* Ecklon).

EXOMIS Fenzl

†1. *axyrioides* Fenzl—P.E., Feb.; Redhouse, Jan.; on cultivated spots near the Zwartkops R., Jan., E. and Z. 71.

ATRIPLEX L.

1. *littoralis* L.—Uit., 50 to 500 ft.
2. *Halimus* L.—Near the Zwartkops R., Dec.; Uit., 50 to 500 ft., Jan., Z. 616.

CHENOLEA Thunb.

†‡1. *diffusa* Thunb.—Redhouse, Oct.; on sandy places along the strand of Algoa Bay, E. and Z. 501.

SALICORNIA L.

†1. *fruticosa* L.—Redhouse, Mar.; Zwartkops R., Z. 3615; sea-shore of Algoa Bay.
2. **herbacea* L.—Sea-shore of Algoa Bay (*teste* Ecklon).

SUAEDA Forsk.

†1. **caespitosa* Wolley-Dod.—New Brighton, 20 ft.
2. *fruticosa* Forsk.—Redhouse, Dec.; Uit., 50 to 500 ft., Mar., E. and Z.

AMARANTACEAE.

AMARANTUS L.
1. §*retroflexus* L.—Zuurberg, Mar.
†‡2. §*Thunbergii* Moq.—Redhouse, Aug.; Uit., 50 to 500 ft., Mar.,
dd E. and Z.; on cultivated spots near the Zwartkops R.,
dd Dec., E. and Z. 576.
3. §*viridis* L.—Redhouse, Mar.

CYATHULA Lour.
‡1. *globulifera* Moq.—Uit., Schlechter 2564; Zuurberg, Mar., May. (Uit., Schlechter 2566 is probably a poor specimen of this species.)

PUPALIA Juss.
‡1. **lappacea* Juss.—Enon.
‡2. *atropurpurea* Moq.—Van Stadens, May; in the forests of Kraggakamma, Nov., Z. 554.

ACHYRANTHES L.
†‡1. *aspera* L.—In the forests of Kraggakamma, Feb., E. and Z. 3555.

ACHYROPSIS Hook f.
1. *leptostachya* Hook. f.—Redhouse, Apr.; Bethelsdorp, Nov.; Uit., Apr., Schlechter 2523, Jan., E. and Z.

ALTERNANTHERA Forsk.
1. *Achyrantha* R. Br.—Redhouse, Mar.

GOMPHRENA L.
‡1. §*globosa* L.—P.E., Feb.

PHYTOLACCACEAE.

PHYTOLACCA L.
‡1. §*heptandra* Retz.—Schoenmaake s Kop, Apr.; P.E., July, Oct.

LIMEUM L.
1. *aethiopicum* L.—P.E.; Redhouse, Feb.; Coega; near Uit., Schlechter 2497.

PSAMMOTROPHA E. et Z.
1. **parvifolia* E. et Z.—Sandy hills near Witteklip; Zwartkops R.

ADENOGRAMMA Reichb.
1. **sylvatica* Fenzl—Van Stadens Mts.
†2. **galioides* Fenzl—Near the Zwartkops R.

AIZOACEAE.

ORYGIA Forsk.
1. **decumbens* Forsk.—Stony hills near Sundays R.

HYPERTELIS E. Mey.
†1. *arenicola* Sond.—Redhouse, Jan.

PHARNACEUM L.
†1. *dichotomum* L.—Redhouse, Aug.; near Uit., Schlechter 2483.
‡2. *distichum* Thunb.—Humewood, Oct.
†3. *incanum* L.—Walmer, Oct.; Redhouse, Nov.

MESEMBRIANTHEMUM L. [The majority of the specimens of the Herb. of the Alb. Mus. belonging to this genus are in Europe, having been lent to a specialist. This list is compiled from the "Flora Capensis," Vol. II, Berger, "Mesembrianthemen and Portulacaceen" (1908), and notes supplied by Mrs. L. Bolus.]

1. *felinum* Haw.—Zwartkops R.
2. *multiceps* Salm-Dyck—Near the Zwartkops R.; Coega.
3. *rhomboideum* Salm-Dyck—By the Zwartkops R., Coega, and Sundays R.
4. *cultratum* Salm-Dyck—Near the Zwartkops R.
5. *linguiforme* L., var. *cultratum.*—Near the Zwartkops R.
6. *diversifolium* Haw.—Sandy places near Bethelsdorp.
7. *laeve* Thunb.—Sandy places near Sundays R.
8. *crassifolium* L.—Redhouse, T.V.P. 99, F.A.R. 4656.
9. *acinaciforme* L.—Sandy flats near Zwartkops R.
10. *edule* L.—Walmer, T.V.P. 362.
11. *mutabile* Haw.—Dist. of Uit., Ecklon.
12. *congestum* Salm-Dyck—Bethelsdorp, and near the Zwartkops R. and Cape Recife.
13. *virens* Haw.—Sandy places between Bethelsdorp and Cradockstadt.
14. *turbinatum* Jacq.—Redhouse, T.V.P., 110.
15. *uncinatum* Willd.—Witteklip, Pillans 944.
16. *uncinellum* Haw.—Karroo in Zoutpanshoogde, near Zwartkops R.
17. *tenellum* Haw.—P.E. Valley, T.V.P. 1063, Kensit 20.
18. *rigidum* Haw.—On hills near the Zwartkops R.
19. *luteum* Haw.—Aloes, J.L.D.
20. *verruculoides* Sond.—Near the Zwartkops R.
21. *stipulaceum* L.—Uit. dist.
22. *productum* Haw.—Karroo hills near Zwartkops R., Winterhoeksberg, and near Bethelsdorp.
23. *Zeyheri* Salm-Dyck—Near Zwartkops R.; Redhouse, T.V.P. 111.
24. *Lehmanni* E. et Z.—Karroo-like hills near the Zwartkops R.; Redhouse, T.V.P. 2179.
25. *flexuosum* Haw.—Redhouse, T.V.P. 98.
26. *bicorne* Sond.—Near Zwartkops R.
27. *granulicaule* Haw.—Karroo-like hills near Zwartkops R.
28. *simile* Sond.—Near Zwartkops R.; Redhouse, T.V.P. 2162.
29. *glomeratum* L.—Uit. dist.
30. *elegans* Jacq.—Uit.
31. *tuberosum* L.—Zwartkops R.
32. *megarhizum* Don—Redhouse, T.V.P. 2142.
33. *subincanum* Haw.—Karroo-like hills near the Zwartkops R.
34. *testaceum* Haw.—Karroo-like hills near the Zwartkops R.; Redhouse, T.V.P. 7.
35. *Ecklonis* Salm-Dyck—Woods near Addo; Zwartkops R. Var. *glabra.*—Redhouse, T.V.P. 477.
36. *parvifolium* Haw.—Redhouse, T.V.P. 108.
37. *brevifolium* Ait.—Karroo-like hills near Uit.
38. *obliquum* Haw.—Karroo-like hills near the Zwartkops R.
39. *flavum* Haw.—Karroo-like hills near the Zwartkops R.
40. *pruinosum* Thunb.—Near the Zwartkops R.

MESEMBRIANTHEMUM—*continued.*

41. *striatum* Haw.—Near the Zwartkops R.
42. *candens* Haw.—Seashore near Cape Recife.
43. *floribundum* Haw.—Zwartkops R.
44. *intonsum* Haw.—Near the Zwartkops R. and Sundays R.
45. *bulbosum* Haw.—Karroo-like hills near P.E.
46. *stellatum* Mill.—Karroo-like hills near the Zwartkops R.; Coega and Sundays R.
47. *densum* Haw.—Near Zwartkops R.
48. *echinatum* Ait.—Zwartkops R.
49. *nitidum* Haw.—Near the Zwartkops R.
50. *grossum* Haw.—Near the Zwartkops R.
51. *longispinulum* Haw.—Humewood, T.V.P. 2168.
52. *viridiflorum* Ait.—Redhouse, T.V.P. 104.
53. *canaliculatum* Haw.—Karroo-like hills near Zwartkops R.
54. *salmoneum* Haw.—Humewood, T.V.P. 2168.
55. *incomptum* Haw.—Hills near Addo; Van Stadens, T.V.P. 748.
56. *crystallinum* L.—Sundays R. and near Uit.
57. *angulatum* Thunb.—Near the Zwartkops R. and Sundays R.
58. *cordifolium* L.—Zwartkops R.; near Addo.
59. *crassicaule* Haw.—Redhouse, T.V.P. 67.
60. *pallens* Ait.—Near Zwartkops R.
61. *Patersoniae* L. Bolus—Schoenmaakers Kop, T.V.P. 2288.
62. *hamatum* L. Bolus—Aloes, J.L.D. 3004.
63. *Haeckelianum* Berger—Redhouse, T.V.P. 414.
64. *mirabile* N. E. Br.—Redhouse, T.V.P. 212.

TETRAGONIA L.

†1. **echinata* Ait.—Hills near the Zwartkops and Sundays R.
†2. *decumbens* Mill.—Redhouse, July; Humewood, Apr. (var. *obovata*); P.E., 2126; Zwartkops R., Z. 138.
†3. *spicata* L.—Perseverance, Sept.
†4. *fruticosa* L.—P.E., Nov.; Redhouse, Aug.

AIZOON L.

‡1. *glinoides* L.—Van Stadens R., Nov.; Uit., Schlechter 2561; near the Zwartkops R., E. and Z.
2. *rigidum* L.—P.E., May; Redhouse, Aug.; Despatch, June.

GALENIA L.

†1. *secunda* Sond.—Uit., Apr., Schlechter 2561; Paarde Poort, Sept., Bolus 1866.
2. *pallens* Fenzl—Among shrubs near the Zwartkops R., Z. 2144, 2145, 1049.
3. *spathulata* Fenzl—Redhouse, Aug.; P.E., Feb.; near the Zwartkops R., Z. 2188, 1049.
4. *fruticosa* Sond. (= *G. salsoloides* Fenzl)—Uit., Jan.; 50 to 500 ft., E. and Z.

PORTULACACEAE.

ANACAMPSEROS Sims

1. *arachnoides* Sims—Redhouse; sandy ground near Uit., Bolus 549.
2. *filamentosa* Sims—Redhouse.
3. *Telephiastrum* DC.—Redhouse.

PORTULACA L.
†‡1. §*oleracea* L.—Redhouse.

PORTULACARIA Jacq.
‡1. *afra* Jacq.—Green Bushes, P.E.; common in scrub east of the Zwartkops R.; north of Uit. common.

BASELLACEAE.

BOUSSINGAULTIA H.P. et K.
1. §*baselloides* H.B. et K.—A weed, especially in hedges at Uit. and elsewhere.

CARYOPHYLLACEAE (including ILLECEBRACEAE).

DIANTHUS L.
†1. *incurvus* Thunb.—Redhouse.
‡2. *scaber* Thunb.—Bethelsdorp; P.E.; Uit., E. and Z.
3. **crenatus* Thunb.—Zwartkops R.
4. *sp.*—Redhouse, T.V.P. 2646.
5. *sp.* (near *D. holopetalus* Turcz)—Redhouse, Nov., T.V.P. 449*a*.

SILENE L.
1. *bellidioides* Sond.—Redhouse.
†‡2. **capensis* Ott.—Zwartkops R.; Uit.
3. *clandestina* Jacq.—Redhouse.
4. *crassifolia* L.—P.E.
‡5. §*gallica* L.—Redhouse.
6. *primulaeflora* E. et Z.—Bethelsdorp; mouth of Zwartkops R.
7. §*sp.*—P.E., Aug., T.V.P. 2543, 204.

STELLARIA L.
†‡1. §*media* Villars—Redhouse.

CERASTIUM L.
†1. *capense* Sond.—Redhouse.

SPERGULA L.
†‡1. §*arvensis* L.—P.E.

SPERGULARIA Pers. (= LEPIGONUM Fries in "Flora Capensis," I, p. 134).
†‡1. *media* Presl—Redhouse.
†2. **rubra* Fenzl—Zwartkops R.

POLYCARPON Loefl.
†‡1. §*tetraphyllum* L.—Redhouse.

POLLICHIA Soland.
‡1. *campestris* Soland.—Redhouse, Mar.; P.E., Jan.

HERNIARIA L.
†1. *hirsuta* L.—Humewood, Sept.; P.E., Oct.

CORRIGIOLA L.
†‡1. §*littoralis* L.—Redhouse, July; Baakens R. valley, May.

NYMPHAEACEAE.

NYMPHAEA L.
†‡1. *capensis* Thunb. (= *stellata* Willd.)—Redhouse, etc.

RANUNCULACEAE.

CLEMATIS L.

†‡1. *brachiata* Thunb. (including *Cl. Thunbergii* Steud., which cannot be satisfactorily distinguished from *Cl. brachiata*)—Schoenmaakers Kop; near Uit., Schlechter 2565.

KNOWLTONIA Salisb.

1. *capensis* (L.) Huth (= *rigida* Salisb.).—Uit.; P.E.
2. *rotundifolia* Huth—P.E.

†‡3. *vesicatoria* DC.—Van Stadens; Zuurberg.

RANUNCULUS Hall.

1. *pubescens* Thunb. (= *R. pinnatus* Poir.).—Walmer; Uit.; near Paarde Poort.

MENISPERMACEAE.

CISSAMPELOS L.

1. **torulosa* E. Mey.—Galgebosch; Van Stadens.

ANTIZOMA Miers

†1. *capensis* (L. f.) Diels—Redhouse; Schoenmaakers Kop; woods near Zwartkops R., Z. 697.

LAURACEAE.

CASSYTHA L.

†‡1. *ciliolata* Nees—Baakens R. Valley, Apr.; Zuurberg, Mar.

OCOTEA Aubl.

†1. *bullata* Benth.—In a forest patch on the Elandsberg (*teste* Dyer).

PAPAVERACEAE.

PAPAVER L.

‡1. §*aculeatum* Thunb.—P.E. Valley.

ARGEMONE L.

‡1. §*mexicana* L.—P.E.

CORYDALIS DC.

1.*§*cracca* Schlecht.—Uit.

‡2. **pruinosa* E. Mey.—Enon.

FUMARIA L.

‡1. §*officinalis* Linn.—Baakens R. Valley.

CRUCIFERAE.

BRASSICA Koch

1. **leptopetala* Sond.—Zwartkops; Uit.; Addo.

‡2. §*strigosa* DC.—Sundays R., near Addo Drift, MacOwan 993.

DIPLOTAXIS DC.

1. §*muralis* DC.—Humewood.

SINAPIS Koch

1. §*retrorsa* Burch.—P.E.

HELIOPHILA L.

†1. **abrotanifolia* Herb. Banks—Uit.
2. *brachycarpa* Meisn.—P.E.
3. *florulenta* Sond.—Near Zwartkops R.; near Bethelsdorp.
4. *glauca* Burch.—Uit.
†5. **linearifolia* Burch.—Zwartkops R.
‡6. *linearis* DC.—Humewood; Zwartkops R. mouth; Redhouse.
7. *macrosperma* Burch.—Redhouse.
8. *pendula* Willd.—Redhouse; P.E.
9. *suavissima* Burch.—Redhouse.
†10. *subulata* Burch.—Redhouse; Humewood: Walmer; Van Stadens, Schlechter 6068.
11. *stylosa* Burch.—Baakens R. Valley; Zuurburg.
12. **succulenta* Herb. Banks—Uit.
‡13. **virgata* Burch.—Van Stadens Mts.; near P.E.

NOTE.—*H. suavissima*, *succulenta*, and *subulata* do not seem to be sufficiently distinct to be kept separate.

NASTURTIUM R. Br.

‡1. §*fluviatile* E. Mey. (= *Rosina nudiuscula* Thell. in Schinz, Beitr., XXIV, 259).—Zwartkops and Bushman's Rs.; near Blue Krantz, Bolus 1878.
†‡2. §*officinale* R. Br.—Walmer; Uit.

SISYMBRIUM All.

1. *Burchellii* DC.—Redhouse.
‡2. **capense* Thunb.—Zwartkops.

LEPIDIUM L.

†1. **africanum* DC.—Zwartkops R.
†‡2. *capense* Thunb.—P.E.; Schoenmaakerskop.
3. **hirtellum* Sond.—Uit., July.

CAPSELLA Vent.

†1. §*Bursa-pastoris* Moench.—P.E.

CAPPARIDACEAE.

CAPPARIS L.

‡1. *citrifolia* Lam.—Redhouse; Despatch; Klassen's, near Paarde Poort, Bolus 1654; Loerie R.
2. *oleoides* Burch. (= *albitrunca* Burch.)—Uit.
3. **Volkmeriae* DC.—Kraggakamma and Addo.
4. *Zeyheri* Turcz—P.E.

CADABA Forsk.

‡1. *juncea* DC.—Redhouse; Uit.; Loerie R.

MAERUA Forsk.

1. *triphylla* Wendl.—P.E.; in the forests of Addo and by the Zwartkops R.; Redhouse; Klassen's, near Paarde Poort, Bolus 1653.

DROSERACEAE.

DROSERA L.

1. *cistiflora* Linn.—Van Stadens; P.E.
2. *cuneifolia* Thunb.—Redhouse.

CRASSULACEAE.

DINACRIA Harv.

1. *grammanthoides* Schonl.—Walmer, Oct.

CRASSULA L.

†1. *natans* Thunb. (= *Helophytum natans* E. et Z.)—P.E.; Redhouse, July–Sept.
‡2. *inanis* Thunb. (= *Helophytum inane* E. et Z.)—Van Stadens; in water not far from the saltpan by the Zwartkops R., Z. 729.
†3. *Vaillantii* (Willd.) Schonl.—Redhouse, Aug.–Oct.; Uit.
†4. *decumbens* Thunb. (non E. et Z.) (*Bulliarda trichotoma* E. et Z.)—Humewood, Sept.–Nov.
†5. *glomerata* L.—Humewood, Sept.
†‡6. *campestris* (E. et Z.) Harv.—Humewood, Sept.; Redhouse, Aug.
7. *parvula* Harv.—Uit., Apr., Schlechter 2583.
†8. *lycopodioides* Lam.—Redhouse, May–Aug.; Koega-Kamma Kloof and Commando Kraal.
‡9. *expansa* Dryander—Bethelsdorp; Redhouse, Dec.
‡10. *ericoides* Haw.—Redhouse, May; Frames Drift, Mar.; Despatch; foot of Witteklip; Zuurberg.
11. *lineolata* Dryander—P.E., Oct., Nov.; Redhouse, Nov.; in shady places near Zwartkops R., Z. 981.
12. *pellucida* L. (*Cr. marginalis* Dry.)—Kamaehs, Sept.; Bethelsdorp, Nov.; Redhouse, Oct.
‡13. *brachypetala* E. Mey., var. *parvisepala* Schonl.—Zuurberg, Apr.
14. *Aitoni* Britt. et Bak. f. (= *Cr. cordata* Ait.)—Zwartkops R., E. and Z. 1898; Redhouse.
15. *spathulata* Thunb.—Redhouse, Mar.; Bethelsdorp, Nov.
16. **Cotyledon* Jacq.—Zwartkops R.
17. *portulacea* Lam.—Redhouse, July.
‡18. *lactea* Soland.—Van Stadens; Addo and on the banks of the Zwartkops R., Z. 311, 2540, E. and Z. 1877; Redhouse, June–Aug.
‡19. *multicava* Lem. (= *Cr. quadrifida* Bak.)—Redhouse, Aug.
20. *tetragona* L.—Cradock Place, May, E. E. Galpin 1902; Redhouse.
21. *biplanata* Haw.—Redhouse, Jan.; in the woods by the Zwartkops R., Z. 2532.
22. *fruticulosa* L., var.—Cockscomb, Mar.
23. *acutifolia* Lam.—Redhouse, Feb., Dec.
‡24. *crenulata* L.—Thornhill, Jan.; Van Stadens, Jan.; Redhouse.
25. *rubricaulis* Harv.—Van Stadens; Baakens R. Valley, Apr.
26. *vaginata* E. et Z.—Zuurberg.
27. *ramuliflora* Link. et Otto (= *Cr. stachyera* E. et Z.)—Zuurberg, Mar.
‡28. *corymbulosa* Link—P.E., Mar.; Redhouse, Mar.
29. *rufo-punctata* Schonl.—Redhouse, Jan.
30. *turrita* Thunb.—P.E., Nov. Var. *paniculata* Schonl. Ms.—Redhouse, Oct.
‡31. *rosularis* Haw.—Redhouse, Aug.; in woods near the Zwartkops R., E. and Z. 1901; Bethelsdorp, Nov.

‡32. *orbicularis* L.—Bethelsdorp, Nov.
‡33. *perforata* L. f.—P.E., Nov. ; Redhouse, Jan. ; in scrub near the Zwartkops R., E. and Z. 1888 ; Zwartkops and Addo, Z. 310 ; Zuurberg, Mar.
34. *Patersoniae* Schonl.—Bethelsdorp, June ; Craddock Place, June.
35. *perfoliata* L.—Green Bushes, near P.E., Feb., T.V.P. 441 ; Redhouse, Jan.
‡36. *falcata* Willd.—Green Bushes, near P.E., Feb.
†37. *sphaeritis* Harv.—Uit., 50 to 500 ft., E. and Z. 994 ; Bethelsdorp, Sept. ; P.E.
†38. *ciliata* L.—P.E., Jan. ; Witteklip, Nov., Dec. ; MacOwan 1047 ; Redhouse, Dec.
39. *micrantha* Schonl.—Redhouse, Aug.
40. *trachysantha* E. et Z.—Redhouse ; Zuurberg, Mar.
41. *margaritifera* (E. et Z.) Harv.—Bethelsdorp ; Walmer.
42. *cultrata* L., var. *radicans* (Haw.) Schonl.—Redhouse ; P.E., Jan. ; Humewood ; Aloes.
43 . *Rogersii* Schonl.—Springfields, Uit., Nov.
44. *obvallata* L.—Bethelsdorp ; Coega ; Uit., Z. 1044.
†45. *nudicaulis* L. (incl. *Cr. sulcata* Harv.).—Walmer, Oct. ; Zwartkops R., E. and Z. 1928.
46. *cephalophora* Thunb. (= *Cr. canescens* Roem. et Schult.).—On sand-hills near the Zwartkops R., Z. 345, 1993, 2553.
47. *Tayloriae* Schonl.—P.E.
48. *platyphylla* Harv.—P.E., J.L.D. 654.
†49. *saxifraga* Harv.—P.E.
50. *nemorosa* E. et Z.—Redhouse, Oct. ; Bethelsdorp.

Rochea DC.

†1. *jasminea* DC.—Cockscomb Mts., Mar.

Cotyledon L.

1. *velutina* Hook. f., var. *Beckeri* Schonl.—Common in karroid scrub at Redhouse.
†‡2. *orbiculata* L.—Redhouse ; Bethelsdorp.
3. *coruscans* Haw.—P.E.
4. *ramosissima* Haw.—P.E. ; Zwartkops.
5. *decussata* Sims—Blue Cliffs.
6. *teretifolia* Thunb.—Elands River.
7. *_tomentosa_ Harv.—Uit.
8. *rhombifolia* Haw.—P.E. ; Avontuur Line to Green Bushes.
9. *Cooperi* Bak.—Zuurberg.
10. *cristata* Haw.—Redhouse, Mar.

Kalanchoe Adans.

‡1. *rotundifolia* Haw.—Redhouse, Mar., T.V.P. 523.
‡2. *hirta* Harv.—Uit., Z.

SAXIFRAGACEAE.

Montinia L.

1. *acris* L.—Bethelsdorp, Aug. ; Van Stadens Mts.

PITTOSPORACEAE.

Pittosporum Banks

‡1. *viridiflorum* Sims—P.E. Valley, Nov. ; Van Stadens Mts., Z. 382 ; Bethelsdorp.

CUNONIACEAE.

CUNONIA L.

†‡1. *capensis* L.—Zuurberg, May.

PLATYLOPHUS Don.

1. **trifoliatus* Don—Van Stadens Mts., E. and Z.

BRUNIACEAE.

BERZELIA Brongn.

1. *commutata* Sond.—P.E.; Van Stadens, Dec.
2. *intermedia* Schlecht.—Van Stadens, Nov.

†3. *lanuginosa* Brongn.—Van Stadens R. Mts., Bolus 1574.

BRUNIA L.

†1. **nodiflora* L.—Van Stadens (*teste* Dümmer).

PSEUDOBAECKIA T. Anders.

1. **cordata* Niedenzu—Uit., Z. 593 (*teste* Dümmer).
2. **racemosa* Niedenzu—Van Stadens, Z. 2225 (*teste* Dümmer).

HAMAMELIDACEAE.

TRICHOCLADUS Pers.

1. *ellipticus* E. et Z.—Springfields, Nov.

‡2. *crinitus* Pers.—Van Stadens, MacOwan 2065; Addo Bush, Z. 625.

ROSACEAE.

RUBUS L.

†1. **pinnatus* Willd.—Addo; Uit.

†‡2. *rigidus* Sim—Walmer, Nov. Var.—Banks of Zwartkops R. and Addo, Z. 66.

ALCHEMILLA L.

†‡1. *capensis* Thunb.—Addo and Van Stadens, Z. 693; Zuurberg.

CLIFFORTIA L.

†1. *ilicifolia* L.—Thornhill, July; Zwartkops R. and Van Stadensberg, Z. 19; ? Witteklip, Jan., Bolus 9119.

2. *cordifolia* E. Mey.—Walmer, Mar.

†3. *odorata* Linn. f.—Theescomb.

†4. *ferruginea* Linn. f., var. *b*.—Kraggakamma, MacOwan 1082.

‡5. **linearifolia* E. et Z.—Zwartkops R.

†6. *strobilifera* L.—Banks of the Zwartkops R., Z. 57; Van Stadens R. Mts., Jan., Bolus 1572; Zuurberg.

7. *drepanoides* E. et Z.—Kamaehs, Nov.; Winterhoek, E. and Z. 1741.

†8. *juniperina* L. f.—Van Stadens Mts., May; Zuurberg, Oct.

LEGUMINOSAE.

CYCLOPIA Vent.

1. *Vogelii* Harv.—Van Stadens, Nov.
2. *pubescens* E. et Z.—Van Stadens Mts.

PODALYRIA Lam.

1. *Burchellii* DC.—Van Stadens, Sept., E. and Z. 1157, Z. 824.

†2. *calyptrata* Willd.—P.E.

†3. *cuneifolia* Vent.—Walmer, Aug.; Van Stadens, E. and Z. 1179; in the stony channel of the Zwartkops R., Z. 109.

PRIESTLEYA DC.

1. *hirsuta* DC.—Bethelsdorp, June; Van Stadens, E. and Z. 1220; Walmer Flats; P.E.

AMPHITHALEA E. et Z.

1. *phylicoides* E. and Z.—Van Stadens, Z. 2287.
2. **micrantha* Walp.—Van Stadens.

BORBONIA L.

†1. *lanceolata* L.—Van Stadens, Sept., Z. 336, Bolus 1606; at the foot of the Witteklip Mts., Jan., MacOwan 1099, Bolus 13232.

RAFNIA Thunb.

1. **elliptica* Thunb.—Van Stadens; Addo.

LOTONONIS (DC.) Benth.

‡1. **cytisoides* Benth., var. *brevifolia* (Dümmer in *Trans. Roy. Soc. S. Afr.*, III, 289).—Uit., Z. 856.
2. *azurea* Benth.—Van Stadens, Schlechter 6072, Bolus 1066; P.E., Nov., Z. 1262, 922; Humewood.
3. **acuminata* E. et Z.—P.E., Burchell 4361; in fields by the Zwartkops R.
4. **argentea* E. et Z.—Near Uit.; Burchell 4463 may belong to this species.
5. **debilis* Benth.—P.E., Bolus 2666.
6. *trichopoda* Benth.—Redhouse, Dec.; P.E., Feb.; New Brighton.
7. **monophylla* Harv.—Van Stadens.
8. *porrecta* Benth.—Redhouse.
9. *Leobodea* Benth.—Redhouse, Aug.; Zwartkops R., E. and Z. 1264.
10. **pumila* E. et Z.—Uit. div.
11. *tenella* E. et Z.—Redhouse, Dec.
12. **versicolor* Benth.—On the fields near the Zwartkops R.
13. **neglecta* Dümmer.—Uit.
14. *sp.*—P.E., July, J.L.D. 514; Bethelsdorp, Z.; between Coega and Sundays Rs., Z. 401.

LEBECKIA Thunb.

1. *psiloloba* Walp.—Redhouse, Oct.; Uit., E. and Z. 1340, Z. 737.
†2. *Plukenetiana* E. Mey.—Walmer, Oct.
†3. *sepiaria* Thunb.—Uit.; Walmer.
‡4. *mucronata* Benth.—Van Stadens; Uit.; Van Stadens R. Mts., 1000 ft., Bolus 1605.

ASPALATHUS L.

†1. **ciliaris* L.—Uit.
†2. *spicata* Thunb.—Despatch, Oct.; Van Stadens, MacOwan 2057.
†3. *thymifolia* L.—Bethelsdorp, Nov.; P.E.
4. *rubro-fusca* E. et Z.—On the hills near the Zwartkops R., E. and Z. 1467.
5. *teres* E. et Z.—Witteklip, Bolus 9118.
†6. *rigescens* E. Mey.—P.E., May, Mar.; Van Stadens, Z. (typical); between Coega and Sundays Rs., E. and Z. 1461 (var. *echinata*).
7. **opaca* E. et Z.—Uit.

ASPALATHUS—*continued.*

†‡8. *laricifolia* Berg.—Baakens R.Valley, P.E.; Redhouse, Feb.; Walmer; Van Stadens, Bolus 1594.

†‡9. *canescens* L.—P.E., June; Van Stadens Mts., Bolus 1595.

10. *frankenioides* DC.—Van Stadens (var. *poliotes*); Van Stadens, E. and Z. 1437 (var. *intermedia*).

11. *setacea* E. et Z.—Van Stadens Mts., Bolus 1592.

12. *collina* E. et Z.—Redhouse, July; near P.E., Z. 2366.

13. *adelphea* E. et Z.—Redhouse, Apr.; P.E., Feb., Bolus 168; on the grass swamps of the Zwartkops R. and the Addo Hills, E. and Z. 1441, 1443; Aloes.

14. *argyrea* DC.—P.E.; Zwartkops R., Sept.; Uit.; Bethelsdorp, June.

†‡15. *spinosa* L.—Redhouse, Mar.; near the Zwartkops R., E. and Z. 1499, Z. 257, 2365 (var. *horrida*), Z. 415 (var. *longifolia*); near Uit., Jan., Bolus 1591.

16. *marginalis* E. et Z.—Near the Zwartkops R., Z. 2349; Redhouse; valley near Kleinschool, Bolus 2289.

17. *rubens* Thunb.—Van Stadens, Z. 2325; E. and Z. 377, Oct.

†18. *astroites* L.—Van Stadens, Nov.; Redhouse, Oct.

19. *nivea* Thunb.—Hills near Uit.; on the banks of the Zwartkops R., MacOwan 1056.

†20. *suffruticosa* DC.—Baakens R. Valley, P.E.; near Zwartkops R., E. and Z. 1405.

Mrs. Bolus has supplied the following note on a plant collected by Dr. G. Potts (No. 299) in Jan., 1907, at Humewood: "This seems near *A. verrucosa* L., but differs (1) in having the ovary 2-ovuled, (2) in the size of the fruit. It is also near *A. adelphea* E. et Z., but differs (1) in the calyx segments being longer and more acute, (2) longer leaves. It might be regarded as a n. sp. or a var. of either of the above two."

BUCHENROEDERA E. et Z.

1. *multiflora* E. et Z.—Van Stadens.

MELOLOBIUM E. et Z.

1. *candicans* E. et Z.—Redhouse, Mar.; near Uit., Schlechter 2491.

2. *microphyllum* E. et Z.—Redhouse, Sept.

CROTALARIA L.

1. *obscura* DC.—Humewood, Oct.; Schoenmaakers Kop, Apr.; Uit. dist., E. and Z. 1250.

2. *purpurea* Vent.—Thornhill, July; Uit.

†‡3. *capensis* Jacq.—Near the Zwartkops R., E. and Z. 1258; between Gamtoos and Van Stadens R., Bolus 2285.

MEDICACO L.

†‡1. *denticulata* W.—P.E.

†‡2. *laciniata* All.—In karroid places in Uit. dist., E. and Z. 1504.

MELILOTUS Tournef.

†1. §*parviflora* Desf.—Redhouse, Dec.

ARGYROLOBIUM E. et Z.
- ‡1. *tuberosum* E. et Z.—Van Stadens, E. and Z., Bolus 1597.
- 2. *crassifolium* E. et Z.—Redhouse, Mar.; Baakens R. Valley, Apr.; Elands R., E. and Z. 1305.
- 3. *incanum* E. et Z.—Van Stadens, Sept.
- 4. *sericeum* E. et Z.—Van Stadens, MacOwan 1031, Z. 323, Bolus 1596.
- 5. *collinum* E. et Z.—Uit. dist., in many places; ? Redhouse, Dec., T.V.P. 424 in Herb. Bolus.
- ‡6. **uniflorum* Harv.—Van Stadens Mts.
- 7. **barbatum* Walp.—Uit.
- 8. *pumilum* E. et Z.—Show Ground, P.E.; Van Stadens, E. and Z. 1308; near the Zwartkops R., E. and Z. 1310.
- 9. *patens* E. et Z.—Grassy pastures near the Zwartkops R.; Zoutpanshoogde, Z. 2304.
- ‡10. *Andrewsianum* Steud.—Springfields, Mar.; Uit., Schlechter 2522, 500 ft., Apr., 1893 (var. *B*.).

TRIFOLIUM L.
- †‡1. *Burchellianum* Ser.—Walmer, Oct.; Van Stadens, Z. 451; P.E., Sept., 1903; Addo and P.E., E. and Z. 1507.
- †2. *stipulaceum* Thunb.—Algoa Bay; near the Zwartkops R.

PSORALEA L.
- †‡1. *pinnata* L.—Van Stadens, Sept.; near P.E., Sept., Bolus 220.
- 2. *oligophylla* E. et Z.—Uit., E. and Z.; Zuurberg.
- 3. *verrucosa* Willd.—Walmer, Oct.; P.E.; near the Zwartkops R., E. and Z. 1521.
- 4. *axillaris* L.—Van Stadens R., Jan., Bolus 1548.
- 5. *polyphylla* E. et Z.—Uit., E. and Z. (Pappe 13).
- 6. *repens* L.—Redhouse, Apr.; Humewood.
- †7. *decumbens* Ait.—Redhouse, Sept.; P.E., Oct.; near the Zwartkops R., E. and Z. 1033.
- ‡8. *polysticta* Benth.—Zuurberg.
- 9. **triantha* E. Mey.—Zwartkops R.
- 10. *candicans* E. et Z.—Redhouse, Oct.
- †11. *capitata* L.—Redhouse, Mar.; Witteklip, MacOwan 2068, Bolus 13233; Zwartkops R., Z. 84.
- †12. *bracteata* L.—Walmer, Oct.; Redhouse, Mar.; Van Stadens, Z. 271 (var. *algoensis*).
- 13. **tomentosa* Thunb.—Uit. dist.
- 14. *Patersoniae* Schonl.—Redhouse, Dec.

INDIGOFERA L.
- ‡1. *denudata* Thunb.—Van Stadens, MacOwan 1107. Var. *luxurians*—Van Stadens, Z. 276, E. and Z. 1566, Jan., Bolus 1590. Var. *simplicifolia*—Elands River, Z. 2420. Var. *inermis*—Zwartkops R.
- 2. *stenophylla* E. et Z.—Van Stadens, Sept.; Bethelsdorp, Nov.
- 3. *complicata* E. et Z.—Van Stadens, Sept.
- 4. *heterophylla* Thunb.—Redhouse, Nov.; Uit.; P.E.
- 5. **leptocarpa* E. et Z.—Uit.
- 6. *porrecta* E. et Z.—Redhouse, Aug.; Walmer; by the Zwartkops R. and Addo; New Brighton, Aug.
- 7. **tomentosa* E. et Z.—Mouth of the Zwartkops R.
- †8. *incana* Thunb., var. *angustistipulata* Bak. f.—P.E.

Indigofera L.—*continued.*

9. *sulcata* DC.—Walmer, Aug. ; Van Stadens, E. and Z. 1601, Bolus 1904 ; P.E., June.
10. **hispida* E. et Z.—On the mountains above Uit.
11. *stricta* L.—Schoenmaakers Kop, Mar. ; Uit.
‡12. **fastigiata* E. Mey., var. *angustata*.—Zwartkops R.
13. **poliotes* E. et Z.—Uit.
†14. *Zeyheri* Spr.—Emerald Hill, Mar. ; Uit. ; Zwartkops ; Addo, etc.
15. *leptophylla* E. Mey. (= *L. Zeyheri*, var. *leptophylla* Harv.).—Near Zwartkops R. and Addo, E. and Z. 1110, Z. 2433.
16. *glaucescens* E. et Z.—Zwartkops R., Z. (Pappe 69).
17. **pauciflora* E. et Z.—Uit.
18. *disticha* E. et Z.—Redhouse, Dec., Oct. ; Uit. dist., July, 1500 ft., Bolus 33.
‡19. **alternans* DC.—Uit.
‡20. **argyrea* E. et Z.—Near Uit.
21. ? *falcata* E. Mey.—Redhouse, Oct., T.V.P. 239.
22. *sessilifolia* DC.—Between Sundays and Zwartkops Rs., 1000 ft., Z. 1109 and E. and Z. 1559 ; Redhouse, Oct.

Tephrosia Pers.

1. **stricta* Pers.—Near Van Stadens R.
†‡2. *capensis* Pers.—Redhouse, Oct. ; near Zwartkops R. and Addo, Z. 59 ; Zwartkops R. mouth ; Emerald Hill, Oct. ; P.E., Feb., Oct. ; Van Stadens, Bolus 2299 ; near Uit., Jan., Bolus 13231.

Note.—The variety *hirsuta* Harv. is found on the Zuurberg (T.V.P. 33) and at Coldstream, near Grahamstown (S Schonland 1521) It may have to be considered a distinct species

3 *grandiflora* Pers —Uit ; Van Stadens ; Uit., E and Z 1629
‡4 *aemula* E Mey —Emerald Hill, Dec., Bolus 10633

Sutherlandia R. Br.

†‡1 *frutescens* R. Br.—Redhouse, Nov. ; Uit. dist., E. and Z. 1658.

Lessertia DC.

†1. **linearis* DC.—Zwartkops R. ; Uit.
2. *physodes* E. et Z.—Van Stadens, Sept., T.V.P. 177 ; Uit.
3. **depressa* Harv.—Zwartkops R.
4. *carnosa* E. et Z.—Karroid places at the mouths of the Coega and Sundays Rs. ; Zoutpanshoegde, Z.
5. *brachystachya* E. Mey.—Redhouse, Aug. ; Zwartkops R., E. and Z. 1635.
6. *stenoloba* E. Mey.—Zwartkops R. ; P.E. Var. *obtusata*—Near the Zwartkops R., E. and Z.
7. *annularis* Burch.—Despatch, Aug.
8. *Kensitii* L. Bol., n. sp.—Humewood, Sept.

Hallia Thunb.

†1. *virgata* Thunb.—Frames Drift, Mar. ; near Zwartkops R., Z. 574, 4818 ; P.E., Dec. ; Van Stadens.
†2. *cordata* Thunb.—Van Stadens, Oct., Jan., Bolus 1589 ; near Zwartkops R., Z. 514.
†3. *asarina* Thunb.—Van Stadens, Z. 704.

Note.—I fail to see any permanent distinctions between 2 and 3.

VICIA L.

†‡1. §*sativa* L.—Redhouse, Nov.; Walmer, Oct.

ERYTHRINA L.

‡1. *caffra* Thunb.—Redhouse, Aug.; Uit.

VIGNA Savi

‡1. *vexillata* Benth.—Redhouse, Mar.; near Zwartkops R., E. and Z. 1682.
‡2. **triloba* Walp.—Sand-dunes near Algoa Bay.
3. *luteola* Benth.—Bethelsdorp, Jan.

DOLICHOS L.

†‡1. *gibbosus* Thunb.—Bethelsdorp, Nov.; Redhouse, Oct.
2. *hastaeformis* E. Mey.—P.E., Feb.; Redhouse, Dec.; Uit., Apr., Schlechter 2498.
‡3. *angustifolius* E. et Z.—Near Uit., Schlechter 2560; Sundays and Zwartkops Rs.
4. **linearis* E. Mey.—Zwartkops R.

RHYNCHOSIA Lour.

1. *leucoscias* Benth.—Van Stadens, Nov.; Walmer.
2. *secunda* E. et Z.—Redhouse, Aug.
‡3. *carribea* DC. (= *gibba* E. Mey.)—P.E., Sept.; Redhouse, Apr.; near Uit., Schlechter 2572.
4. *puberula* Harv.—Redhouse, Mar.; Addo, Z. 840, 1677.
5. *gibba* E. Mey.—Schoenmaakerskop.
‡6. **Totta* DC.—Uit.
†7. *glandulosa* DC.—Walmer, Oct.; Uit.
‡8. **orthodanum* Benth., var. *Muhlenbeckii*.—Uit.

ERIOSEMA DC.

‡1. *squarrosum* Walp.—Redhouse, Apr.; Van Stadens, Mar.; Addo.

VIRGILLA Lam.

†1. *capensis* Lam.—Van Stadens, Nov., MacOwan 1057, Bolus 1546.

CALPURNIA E. Mey.

‡1. *sylvatica* E. Mey.—Elands R., Dec.

CASSIA L.

†‡1. §*tomentosa* Lam.—Gamtoos R., Schlechter 6049.
‡2. *mimosoides* L.—Redhouse, Feb.; P.E., Jan.; Van Stadens, MacOwan 2081; Uit., Z. 536.
‡3. §*occidentalis* L.—P.E. Valley.

SCHOTIA Jacq.

1. *stipulata* Ait.—Bethelsdorp, June; Baakens R., Jan.; P.E.
2. *speciosa* Jacq.—Redhouse, Mar.; Zwartkops R., etc., Z. 47; P.E., June.
‡3. *latifolia* Jacq.—Humewood, Jan.; Van Stadens, Z. 1701, MacOwan 2458; Baakens R., Jan.; Uit., Jan.; Paarde Poort, Jan., Bolus 1547.

ACACIA Willd.

†‡1. *horrida* Willd.—Redhouse, Dec.; near Zwartkops and Addo, E. and Z. 605.
‡2. *caffra* Willd.—Elands R., Nov.; Zwartkops and Sundays R., Z. 560.

Various species of Australian acacias have become naturalized on the driftsands near P.E., on which especially *A. saligna* and *A. cyclopis* have been largely planted.

GERANIACEAE.

Erodium L'Her.
†1. §_moschatum_ L'Her.—P.E., Sept.
2. _sp._ (may be _E. moschatum_ also).—Redhouse, Mar.

Geranium L.
‡1. *_caffrum_ E. et Z.—Zwartkops R.
†‡2. _incanum_ L.—Van Stadens, Sept. ; Walmer, Dec.
†‡3. *_ornithopodum_ E. et Z.—P.E.

Pelargonium L'Her.
1. *_acetosum_ (L.) Ait.—Between Coega and Sundays Rs.
†‡2. _alchemilloides_ (L.) Ait.—Redhouse ; P.E. Var. _dentatum_—Uit., Z. 230, 594.
3. *_caffrum_ (E. et Z.) Harv.—Van Stadens Mts.
4. _campestris_ E. et Z.—Redhouse.
†‡5. _capitatum_ (L.) Ait.—Zwartkops R., Z. 630.
6. _carnosum_ (L.) Ait.—Redhouse ; between Zwartkops R. and Sundays R. ; Uit. ; Kamaehs.
7. _cordatum_ L'Her.—Van Stadens, MacOwan 1048, Bolus 1611.
8. _dichondraefolium_ DC.—P.E.
†9. _grossularioides_ (L.) Ait.—Walmer ; Schoenmaakers Kop ; Theescomb ; P.E.
†10. _hirsutum_ (Burm. f.) Ait.—P.E. ; Van Stadens.
‡11. _inquinans_ (L.) Ait.—Despatch, Dec.
†12. _longifolium_ (Burm. f.) Jacq.—P.E., Nov.
†13. *_lobatum_ (L.) Ait.—Uit.
14. *_multicaule_ Jacq.—Zwartkops R.
†15. _myrrhifolium_ (L.) Ait.—Saltpan near Zwartkops R., Z. 1104.
16. _odoratissimum_ (L.) Ait.—Redhouse, July, Oct.
17. _ovale_ (Burm. f.) Harv.—P.E. ; Walmer ; at the mouth of the Van Stadens R. ; Van Stadens, Schlechter 6075. Var. _ovatum_ Harv.—Walmer, Bolus 1892.
18. _peltatum_ (L.) Ait.—Redhouse, Oct. ; P.E.

Note.—_P. lateripes_ L'Her. does not seem to me specifically distinct from _P. peltatum_. T.V.P. 229 (Redhouse) may be referred to it, also F. A. Rogers 106 (Uit.), W.K. 53 (P.E.), and Z. 181 (Uit.).

19. _populifolium_ E. et Z.—Elands R.
20. *_procumbens_ (Andr.) Pers.—P.E.
‡21. _pulverulentum_ Sw.—Redhouse.
22. _Radula_ (Cav.) L'Herit.—Walmer ; Bethelsdorp, Sept. ; Kamaehs ; Van Stadens ; Uit., Z. 645.
23. *_radulaefolium_ (E. et Z.) Harv.—Zwartkops R.
24. _reniforme_ Curt.—P.E., Bolus 8307 ; foot of Witteklip.
25. _ribifolium_ Jacq.—Van Stadens.
26. *_scandens_ Ehrh.—Bushmans R. and Zuurbergen.
27. _schizopetalum_ Sw.—Van Stadens ; Witteklip.
28. _sidaefolium_ (Thunb.) P. Knuth—Between Zwartkops R. and Addo, Z. 597.
29. _tetragonum_ (L. f.) L'Her.—Avontuur Line to Green Bushes.
30. _tripartitum_ Sw.—Blue Krantz, Bolus 443.
31. _urbanum_ (E. et Z.) Harv., var. _pinnatifidum_ Harv.—Van Stadens ; Humewood ; P.E. ; near Uit. Var. _bipinnatifidum_ Harv.—P.E.

Pelarggnium L'Her.—*continued*

†‡32. *vitifolium* (L.) Ait.—P.E.; near Uit., Bolus 1895.

†‡33. *zonale* (L.) Ait.—Redhouse, Aug.; Uit., Schlechter 2489; Zuurberg.

34. *sp.* (= *Cortusina velutina* E. et Z., non *P. velutinum* L'Herit.).—Redhouse, T.V.P. 85. This species is placed by Knuth under *P. reniforme* (*Bot. Mag.*), but is quite distinct.

35. *sp.* (near *P. fulgidum ;* perhaps a hybrid).—P.E., J.L.D. 105.

Monsonia L.

†‡1. *ovata* Cav.—Redhouse, T.V.P. 63, Aug.; P.E., J.L.D. 8, June; Uit., Z. 439; Van Stadens, Bolus 1544.

OXALIDACEAE.

Oxalis L.

1. **algoensis* E. et Z.—Near P.E.

‡2. *bifurca* Lodd.—Addo, Z. 670; Zwartkops R., Z. 2134.

†3. *caprina* L.—Zwartkops R.; Uit., Z. 2105, 91, 656; Uit., Schlechter 2546; between Sundays R. and Paarde Poort, Bolus 1956.

†4. *cernua* Thunb.—Redhouse; sand-hills at P.E.; Zwartkops R., Z. 2108.

†‡5. *convexula* Jacq.—Humewood; Redhouse.

†‡6. *corniculata* L.—Schoenmaakers Kop.

7. *imbricata* E. et Z.—Thornhill; Redhouse; P.E.; Zwartkops R.; Quaggasvlakte, Z. 93, 94.

†8. *incarnata* L.—Van Stadens.

†9. *lanata* L. f.—Zwartkops R., 50 to 500 ft., Oct., Z. 229.

†10. *obtusa* Jacq.—Near Zwartkops R., Uit., Z. 2120; P.E.

†11. *polyphylla* Jacq., var. *filifolia*.—Van Stadens Mts.; Baakens R. valley, Bolus 2220.

†12. *punctata* L.—Redhouse; Schoenmaakers Kop; near Sundays R. (Coega–Kammaskloof), Z. 2118.

13. **purpurata* Jacq., var. *Bowiei*—Uit.

14. *Smithii* Sond.—Redhouse; Uit., Schlechter 2545; Addo and Quaggasvlakte, Z. 739.

15. *stellata* E. et Z.—Redhouse; Addo, Z. 2140; Zwartkops R., Z. 96, 661.

16. *uitenhagensis* Sond., var.—Redhouse, T.V.P. 2272, 2273; Zwartkops R.; Uit., Z. 2119, 2121.

†17. *variabilis* Lindl.—Walmer; Humewood. *Var. *nana*.—Zwartkops R.

18. *sp.*—Redhouse, T.V.P., Sept.

LINACEAE.

Linum L.

†1. *africanum* L.—Emerald Hill. Var. β.—Walmer, Bolus 1902; Van Stadens. Var. γ.—P.E. beach; at the foot of Witteklip, MacOwan 464.

†‡2. **Thunbergii* E. et Z.—Uit.; Van Stadens Mts.

†3. **quadrifolium* L.—Van Stadens Mts.

ZYGOPHYLLACEAE.

ZYGOPHYLLUM L.

†1. *debile* Ch. et Schl.—Sundays R.; between Roodewal and Blue Krantz, Bolus 1877.

2. *divaricatum* E. et Z.—Redhouse; P.E.; near Commando Kraal, between P.E. and Sundays R., Bolus 2665.

3. *foetidum* Schr. et Wendl.—Avontuur Line to Green Bushes; Zwartkops R.

†4. *fulvum* L.—Humewood; Redhouse; near the coast near P.E., Bolus 2222.

†5. *morgsana* L.—Redhouse; P.E.; between Roodewal and Blue Krantz, Bolus 1880.

6. *uitenhagense* Sond.—Redhouse, Apr.; P.E.; Bethelsdorp.

TRIBULUS Tourn.

†‡1. *terrestris* L.—Redhouse.

RUTACEAE.

DIOSMA L.

†1. *vulgaris* B. et W.—P.E., Jan.

COLEONEMA Bartl. et Wendl.

1. *pulchrum* Hook.—P.E.; Walmer Flats, Bolus 1901; Humewood, Oct.; near Bethelsdorp.

ACMADENIA Bartl. et Wendl.

1. *juniperina* B. et W.—Between Coega and Sundays Rs., 500 to 1000 ft., Jan.

BAROSMA Willd.

†1. *pulchella* Bth.—Walmer, Sept.

2. *venusta* E. et Z.—Van Stadens Mts.

3. **ovata* B. et W.—Van Stadens Mts.

4. **oblonga* E. et Z.—Van Stadens Mts.

5. *scoparia* E. et Z.—Bethelsdorp, Sept.; Van Stadens, May. Var. *ternata*—Van Stadens.

Van Stadens R., Aug., J.L.D. 700 is *B. scoparia* E. et Z., but (1) calyx segments are rather shorter than usual, (2) the specimen is more luxuriant, (3) horns of the fruit are longer than in typical *B. scoparia* (L. B.).

‡6. *lanceolata* Sond.—P.E., Sept. Var. *obtusifolia*—Uit.

7. **microcarpa* Sond.—Between Van Stadens Mts. and Bethelsdorp.

AGATHOSMA Willd.

†1. *hirta* B. et W.—Van Stadens, MacOwan 1035, 1067, Bolus 1603; flats under the Van Stadens Mts., Z. 687; near P.E., Z. 2164; Redhouse, T.V.P. 481; Walmer, T.V.P. 481*a*.

2. **hirtoides* Dümm.—Uit.

3. **leptospermoides* Sond.—P.E.; Van Stadens R.

4. *apiculata* Mey.—Humewood, Oct.; P.E., Bolus 2223; Redhouse.

[*A. apiculata* G. Mey., var. *algoensis* Dümm. (Fedde, Rep. XI, p. 332)—Algoa Bay, Dr. A. Prior (*ex* Dümmer). This variety is not worth separating.]

5. **acutissima* Dümm.—Between Galgebosch and Melkfontein.

6. **pilifera* Schl.—Uit.

7. *gnidioides* Schl.—Paarde Poort, Bolus 1876; Uit. Mts., Sept., T.V.P. 2333 (style glabrous); Kamaehs, Nov.

AGATHOSMA—*continued.*

8. **microphylla* Mey., var. *stadensis.*—Under the Van Stadens Mts.
9. **adenocaulis* E. et Z.—Uit.
10. *gonaquensis* E. et Z.—Baakens R. valley, P.E., J.L.D. 365 ; Schoenmaakers Kop, T.V.P. 572.
11. **barosmoides* Sond.—Sandfontein, near Uit.
12. *ericoides* Schl.—Redhouse, Apr. ; Van Stadens Mts.
13. *decumbens* E. et Z.—Aloes, Sept. ; near Coega R., Uit. ; Redhouse, Aug.
14. *Owanii* Sond.—P.E., Nov. ; Van Stadens, Oct. ; Walmer ; Zondagsvlakte.
15. *chortophila* E. et Z., var. *blaerioides* Dümm.—P.E., Oct. ; Burchell's Valley, near P.E., E. M. Kensit (in Herb. Bolus 6377) ; Bethelsdorp ; Van Stadens.
16. *filipetala* E. and Z.—P.E. ; Humewood, Oct.

MACROSTYLIS B. et W.

1. ? *Patersoniae* Schönl. (in *Trans. Roy. Soc. S. Afr.*, Vol. I, p. 445).—Redhouse and Zwartkops R., Nov., T.V.P. 322. ("Evidently identical with Burchell 5532, named by Oliver *Acmadenia ? A. alternifolia* Ch. et Schl." L. B.)
2. *sp.*—Walmer, T.V.P. 481*a*, Nov.

EMPLEURUM Soland.

1. *serrulatum* Ait.—Uit. Mts. ; Van Stadens, May.

FAGARIA L. (XANTHOXYLUM L.)

‡1. *capensis* Harv.—Van Stadens and Walmer.

TODDALIA Juss.

‡1. *lanceolata* Lam.—Springfields ; Uit.

CLAUSENA Burm.

‡1. *inaequalis* Bth.—Near the Zwartkops R., Z. 498 ; P.E.

CALODENDRON Thunb.

1. *capense* Thunb.—Van Stadens Pass.

MELIACEAE.

EKEBERGIA Sparm.

‡1. *capensis* Sparm.—P.E. Valley ; Uit. ; Van Stadens Pass.

PTAEROXYLON E. et Z. (frequently placed under SAPINDACEAE).

‡1. *utile* E. et Z.—In the woods by the Zwartkops R., Z. 160 ; Kamaehs.

NYMANIA Lindb. (= AITONIA Thunb.) (frequently placed under SAPINDACEAE).

1. *capensis* (Thunb.).—Uit.

POLYGALACEAE.

MURALTIA Neck.

†1. *alopecuroides* DC.—Bethelsdorp (var. *filifolia*) ; P.E. (var. *typica*), Bolus 2219 ; ? Bethelsdorp, T.V.P. 365.
2. *ericaefolia* DC.—Humewood ; P.E. ; Redhouse ; mountains of Uit.
3. *laricifolia* E. et Z.—Van Stadens ; P.E. ; Uit.
4. *squarrosa* DC.—P.E. ; Humewood ; Van Stadens R. Mts., Bolus 1599.
5. **macroceras* DC.—Uit.
6. *Beiliana* Harv.—Zwartkops R. ; Uit.

MUNDIA Kunth

†1. *spinosa* DC.—P.E.; Redhouse.

POLYGALA L.

1. *asbestina* Burch.—Uit.
†2. *ericaefolia* DC.—Bethelsdorp; Humewood; P.E.; Uit.
3. *hispida* Burch.—Thornhill; Schoenmaakers Kop; Walmer, Dec.; Uit.
4. *hottentotta* Presl—Redhouse; Uit.
5. **illepida* E. Mey.—Uit.
†6. *myrtifolia* Linn.—Kamaehs, Nov.; Van Stadens, Sept.
7. *oppositifolia* Linn., var. *cordata*—Redhouse, Aug.; P.E.; Despatch.
8. *refracta* DC., var. *cuspidata* Harv.—P.E., Bolus 1746; Van Stadens Mts., MacOwan 340.
9. *? serpentaria* E. et Z. (without flowers, partly mixed with *P. asbestina ?*).—Zwartkops Hills, T.V.P. 968.
†10. *virgata* Thunb.—Walmer; New Brighton.

EUPHORBIACEAE (excerpted from the "Flora Capensis," Vol. V, pt. 2, and from notes supplied by the Director, Royal Botanic Gardens, Kew, to whom the collection in the Herbarium of the Albany Museum was submitted).

EUPHORBIA L.

‡1. *prostrata* Ait.—Redhouse.
†‡2. *striata* Thunb.—Near Uit.; Coega.
3. *ericoides* Lam.—Van Stadens; Baakens R. valley.
‡4. *Kraussiana* Bernh.—Near P.E. and various other localities (incl. Zuurberg Range).
‡5. *rhombifolia* Boiss.—P.E.; Redhouse; Uit.; Coegakammaskloof.
6. *hastisquama* N. E. Br.—By the Zwartkops R.
†7. *mauritanica* L.—Near P.E. and various other localities.
8. *globosa* Sims—Redhouse; Zwartkops.
†9. *elliptica* Thunb.—Van Stadens; P.E.; Winterhoek Mts.
10. *Gorgonis* Berg.—North End Hill, P.E.; hills between the Sundays and Zwartkops Rs.
11. *inermis* Mill.—P.E.; Zwartkops R.; Redhouse; Coega.
12. *tuberculata* Jacq.—Cannon Hill, near Uit.
13. *Clava* Jacq.—Near P.E.; Cannon Hill, near Uit.; Aloes.
14. *pubiglans* N. E. Br.—Near P.E.; near the Zwartkops R.
15. *mammillaris* L.—P.E.; Redhouse; Uit.
16. *polygona* Haw.—P.E.; Redhouse.
17. *meloformis* Ait.—Zwartkops Hills; Redhouse.
18. *stellata* Willd.—Near P.E.; Redhouse; hills between the Sundays and Zwartkops Rs.
19. *Ledienii* Berg.—Near P.E.; Bethelsdorp; Zwartkops; Redhouse; between Sundays and Zwartkops Rs. Var. *Dregei* N. E. Br.—Near P.E.
20. *triangularis* Desf.—Redhouse.
21. *coerulescens* Haw.—Common in Karroid scrub.
22. *tetragona* Haw.—Zuurberg, etc.

LACHNOSTYLIS Turcz

1. *capensis* Turcz—Between Galgebosch and Melk R.; Van Stadens R.; Kraggakamma; near P.E.; Zwartkops R.; Elands R.

ANDRACHNE L.
1. *ovalis* Mull. Arg.—Springfields; Georgetown.

CROTON L.
1. *rivularis* E. Mey.—Addo, 1000 to 2000 ft.

JATROPHA L.
1. *capensis* Sond.—Addo, 1000 to 2000 ft.

PHYLLANTHUS L.
1. *verrucosus* Thunb.—Between Galgebosch and Melk R.; Elands R.; near Uit.; Zuurberg Range; Addo.
2. *incurvus* Thunb.—Between Kraggakamma and Van Stadens Mts.; between Kraggakamma and upper part of Maitland R.; P.E.; Redhouse; Tzamas; near Enon.
3. *heterophyllus* E. Mey.—P.E.; near the Zwartkops R.; near Uit.

CLUYTIA L.
†1. *ericoides* Thunb., var. *pachyphylla* Prain—Uit. div.
2. *brevifolia* Sond.—Van Stadens Mts.; Redhouse.
‡3. *laxa* Eckl.—Elands Kloof; Uit.
†4. *alaternoides* L.—Van Stadens Mts. Var. *brevifolia* E. Mey. —Van Stadens Mts.
†5. *rubricaulis* Eckl.—Near P.E. Var. *grandifolia* Prain—Algoa Bay.
†‡6. *pulchella* L.—Uit. div.
‡7. *affinis* Sond.—Van Stadens Mts; P.E.; Zwartkops R.
‡8. *dregeana* Schlecht.—Van Stadens Mts.; Elands R.; near Uit.; Zuurberg.
‡9. *hirsuta* E. Mey.—Zuurberg Range, near Bontjes R., 2000 ft. Var. *robusta* Prain.—Addo.
10. *heterophylla* Thunb.—Van Stadens Mts.; near Uit.; very common.
†11. *daphnoides* Lam.—P.E.; various localities in the Uit. div.

LEIDESIA Mull. Arg.
†1. *obtusa* Mull. Arg.—Baakens R. valley; Zwartkops R.; near Uit.; Zuurberg Range.

SEIDELIA Baill.
1. *pumila* Baill.—By the Zwartkops R., near Amsterdam Flats.

ACALYPHA L.
‡1. *glabrata* Thunb.—Kraggakamma; Zwartkops R.; between the Kromme R. and Uit.; Addo, 1000 to 2000 ft.
2. *decumbens* Thunb.—Maitland R., near the lead mine; Zwartkops R. Var. *villosa* Mull. Arg.—Van Stadens Mts.; Zwartkops R.; near Uit.
‡3. *Eckloni* Baill.—Van Stadens Mts.; Zwartkops R.; near Uit.
4. *Zeyheri* Baill.—Van Stadens Mts.
‡5. *peduncularis* E. Mey.—Zwartkops R.; Bontjes R.; Enon.

RICINUS L.
‡1. §*communis* L.—Redhouse, etc.

ADENOCLINE Turcz.
1. *acuta* Thunb.—Baakens R. valley, Nov.
†‡2. *sessilifolia* Turcz., var. *Zeyheri* (= *pauciflora* var.).—Humewood, Apr.

Dalechampia L.

‡1. *capensis* Spreng. f.—Kraggakamma; near P.E.; Tzamas; near Uit.; Enon.

Gelonium Roxb.

‡1. *africanum* Mull. Arg.—Uit.

Stenomeria Harv.

1. *cordata* Harv.—Galgebosch; near Uit.; by the Coega R. and in the Winterhoek Mts.

CALLITRICHACEAE.

Callitriche L.

‡1. **Bolusii* Schonl. et Pax—Uit. dist. Ecklon (*l.c.*, p. 361) simply mentions the occurrence of the genus, which I cannot question as it is found near Grahamstown.

ANACARDIACEAE.

Harpephyllum Bernh.

‡1. **caffrum* Bernh.—Uit.

Loxostylis Spreng. f.

‡1. *alata* Spreng.—Van Stadens, 250 ft., Schlechter 6065.

Laurophyllus Thunb. (Botryceras Willd.).

1. *capensis* Thunb.—Van Stadens, MacOwan 1068, Z. 2241, 229, Bolus 1615; Witteklip.

Rhus L.

†1. *rosmarinifolia* Vahl—P.E.; Uit.

†2. *stenophylla* E. et Z.—Redhouse; Van Stadens, MacOwan 1030; P.E. Var. *brevifolia*.—Van Stadens Mts.

3. *obovata* Sond.—Redhouse; Uit.

†4. *tomentosa* L.—Van Stadens, E. and Z. 1109.

†5. *undulata* Jacq.—Zwartkops R.

6. **excisa* Thunb.—Zwartkops R.; Bethelsdorp; Sundays R. Var. *pallens*—Zwartkops R.

†7. *lucida* L.—P.E., Aug.; Baakens R. valley; Uit., ? Z. 39; Humewood; Redhouse.

†8. **glauca* Desf.—Zwartkops R.

9. *scoparia* E. et Z.—Humewood; Walmer, Oct.; Uit.

10. *longispina* E. et Z.—Zwartkops R. and near Addo, Z. 1048, E. et Z. 1115; Despatch.

‡11. *crenata* Thunb.—P.E. Valley, June; Humewood; Uit.

‡12. **dentata* Thunb.—Van Stadens Mts.

†‡13. *incana* Mill. (= *Rh. villosa* L. f. and incl. *Rh. pyroides* Burch.)—Van Stadens, Sept.; P.E.; Uit., E. et Z. 1100, 1002.

‡14. *refracta* E. et Z.—Uit., Z. 87.

‡15. *puberula* E. et Z.—Addo, E. and Z. 1108; Van Stadens, Mar.

†16. *mucronata* Thunb.—Redhouse; Schoenmaakers Kop; P.E. Var. *Burmanni*—Van Stadens R.

‡17. *laevigata* L.—Near Uit., Z. 314; Springfields; Redhouse, Mar.

18. **Ecklonianа* Sond.—Zwartkops R.

‡19. *viminalis* Vahl—Van Stadens.

20. **lancea* L.—Uit.

21. **discolor* E. Mey.—Van Stadens.

AQUIFOLIACEAE.

ILEX L.

†‡1. *_capensis_ Sond. et Harv.—Near Uit.

CELASTRACEAE.

PUTTERLICKIA Endl.

†1. _pyracantha_ Endl.—P.E., Nov.; Redhouse.

PTEROCELASTRUS Meisn.

‡1. _variabilis_ Sond.—Walmer, Oct.; P.E., Nov.; Redhouse, Mar.

2. *_stenopterus_ Walp.—Uit.

GYMNOSPORIA Wight et Arn. (under CELASTRUS L. in "Flora Cap.").

†‡1. _acuminata_ (L.)—Redhouse; Uit. forests, Z. 546.

2. *_linearis_ (L. f.)—Sundays R.

‡3. _polyacantha_ (Sond.)—Bethelsdorp; Redhouse; Walmer, Apr.; Zwartkops and Sundays Rs., Z. 956.

4. *_Zeyheri_ (Sond.)—Uit.

‡5. _procumbens_ (L.)—Humewood, Aug.; P.E.

‡6. _undata_ (Thunb.)—Zoutpanshoogde, E. and Z. 932, Z. 2190.

7. _capitata_ (E. Mey.)—Redhouse, Aug.

8. *_elliptica_ (Thunb.)—Zwartkops R. and Van Stadens.

†‡9. _buxifolia_ (L.)—P.E., Nov.; on the banks of the Zwartkops R., E. and Z. 944 (_Celastrus humilis_ E. et Z.); _ibid._ E. and Z. 952 (_C. venenatus_ E. et Z.); Humewood, Dec.

‡10. *_angularis_ (Sond.)—Van Stadens.

11. _heterophylla_ (E. et Z.)—Witteklip, Bolus 9137.

†12. _maritima_ Loes.—Schoenmaakers Kop, Mar.; Humewood, Aug.; P.E., May; ? Redhouse, Aug., T.V.P. 2294.

†‡13. _? laurinus_ (Thunb.)—P.E., Oct., W.K. 99.

CASSINE L.

†‡1. _capensis_ L.—Emerald Hill, Mar.; Humewood; Walmer, Apr.; sand-dunes, P.E., Z. 986; Redhouse, Aug.

2. _scandens_ E. et Z.—Schoenmaakers Kop, July; Walmer, Apr.; P.E., Aug., Nov.; Zwartkops, Feb.; Addo. Var. _latifolia_ Sond.—Van Stadens, Z. 2203.

ELAEODENDRON Jacq.

‡1. _capense_ E. et Z.—Van Stadens; Baakens R. Valley, Bolus 2224; Springfields, Nov.; Uit. 2199.

‡2. _croceum_ DC.—Uit. dist., E. and Z. 983.

MYSTROXYLON E. and Z.

1. _confertiflorum_ Tulasne—By the Zwartkops R., E. and Z. 973, 975.

2. _sphaerophyllum_ E. et Z.—Van Stadens; Zwartkops R. mouth, Mar.; by the Zwartkops R., E. and Z. 632; Redhouse, May. Var. _littorale_ Sond.—Bethelsdorp, Jan.; Humewood, Dec.

3. _pubescens_ E. et Z.—By the Zwartkops R., E. and Z. 977.

‡4. _eucleaeforme_ Sond.—Van Stadens, E. and Z. 971.

PLEUROSTYLIA Wight et Arn. (CATHASTRUM Turcz).

‡1. *_capensis_ (Turcz)—Between P.E. and Van Stadens Mts.

LAURIDIA E. et Z.

†1. _reticulata_ E. et Z.—Elands R.; P.E.

ICACINACEAE.

Apodytes E. Mey.

‡1. *dimidiata* E. Mey.—Bethelsdorp, Jan.; Van Stadens, Z. 2024.

SAPINDACEAE.

Allophylus L. (Schmidelia L.)

‡1. *decipiens*.—Humewood, Dec.; on hills of Addo, Z. 515 (sub *Rhus undulata* Jacq.).

Smelophyllum Radlk.

1. *capense* Radlk. (= *Sapindus capensis* E. et Z.).—Redhouse, Nov.; P.E., July; Van Stadens.

Pappea E. et Z.

1. *capensis* E. et Z. (= *Sapindus Pappea* Sond.).—In woods by the Zwartkops R., Z. 166; Redhouse.

Hippobromus E. et Z.

‡1. *alata* E. et Z.—Walmer, Oct.; P.E., Sept.; Uit., Z. 149.

Dodonaea L.

1. **Thunbergiana* E. et Z., var. *linearis*—Near Uit.

MELIANTHACEAE.

Melianthus L.

1. **comosus* Vahl.—Banks of the Gamtoos R., Uit.

BALSAMINACEAE.

Impatiens L.

1. **capensis* Thunb.—Uit.

RHAMNACEAE.

Rhamnus L.

‡1. *prinoides* L'Herit.—Van Stadens R.; Emerald Hill, Mar.; Redhouse, Mar.; Addo Bush, Z. 545; Uit. dist., E. and Z. 992.

Scutia Brongn.

†‡1. *Commersoni* Brongn.—P.E., Aug., Sept.; Uit., Z. 994, 16.

2. *indica* Brongn.—Aloes, Sept.

Noltea Reichb.

†‡1. *africana* Rich.—On the banks of the Zwartkops R., Z. 995, 148.

Helinus E. Mey.

1. **ovata* E. Mey.—Zuurberg Range.

Phylica L.

1. **rigidifolia* Sond.—Van Stadens Mts.

2. *axillaris* L.—P.E., June; Humewood; Van Stadens, Bolus 1612, MacOwan 1073.

3. *villosa* Thunb.—Baakens R. Valley; P.E., Apr.; Van Stadens.

‡4. **paniculata* Willd.—Van Stadens Mts.

5. **Willdenowiana* E. et Z.—Van Stadens Mts.

†6. *ericoides* Thunb.—Redhouse, June; P.E.

7. *gnidioides* E. et Z.—Redhouse, Apr.; Bethelsdorp; P.E., Galpin 6359, Bolus 1049.

8. *lutescens* Sond.—Van Stadens; Zuurberg.

9. *sp.*—Cape Recife, Jan., T.V.P. 1939.

Note.—I cannot always distinguish *Ph. axillaris* and *Ph. villosa*.

AMPELIDACEAE (VITACEAE).

RHOICISSUS Planch.

1. **capensis* (Burm.) Planch.—Uit.
2. *cirrhiflora* (L. f.) Gilg et Brandt—Redhouse; Baakens R.; P.E.; amongst shrubs near Zwartkops R., E. and Z. 32.
3. *dimidiata* (Thunb.) Gilg et Brandt (= *Cissus sericea* E. et Z.)—Elands R. Mt.; Van Stadens, Bolus 1543.
4. *digitata* (L. f.) Gilg et Brandt—Elands R.; P.E.

CISSUS L.

‡1. *lanigera* Harv.—Redhouse.
‡2. *cirrhosa* Thunb.—Walmer, Oct.; Uit.

TILIACEAE.

GREWIA L.

†‡1. *occidentalis* L.—Walmer; P.E.; Schoenmaakerskop.
‡2. *flava* DC.—Redhouse; woods near Uit.

SPARMANNIA L.

1. **africana* L.—Kraggakamma (*teste* Ecklon).

MALVACEAE.

MALVA L.

†‡1. §*parviflora* L.—Redhouse.

MALVASTRUM A. Gray

†‡1. *capense* Gray et Harv.—P.E.
2. **strictum* Gray et Harv.—Uit.

SIDA L.

1. *longipes* E. Mey.—Uit.
‡2. *triloba* Cav., var. *pubescens*—P.E.; Redhouse; Uit.; near Uit., 300 ft., Schlechter 2995 (or ? 2495).

ABUTILON Gaertn.

‡1. *sonneratianum* Cav.—Redhouse, T.V.P. 90 (this equals Ethel West 336, New Brighton; seems different from typical form in having pilose rather than velvety indument—L.B.); P.E.; Schoenmaakerskop.

PAVONIA L.

1. *praemorsa* Willd.—Near Uit., 400 ft., Schlechter 2595.

HIBISCUS L.

†‡1. *aethiopicus* L.—Van Stadens; P.E.; Redhouse. Var. *diversifolius* Haw.—P.E.
†‡2. **diversifolius* Jacq.—Zwartkops R.
3. *Ludwigii* E. et Z.—Redhouse; Kraggakamma.
‡4. *pedunculatus* Cav.—Springfields; P.E.; Van Stadens.
‡5. *pusillus* Thunb.—Redhouse; P.E.; Zuurberg; foot of Witteklip.
†‡6. *trionum* L.—Baakens R. valley; Zuurberg.

STERCULIACEAE.

STERCULIA L.

1. *Alexandri* Harv.—Glen Somers, Winterhoek Kloof; plentiful on farm Kamaehs, north of Uit.; Van Stadens, MacOwan 2066.

HERMANNIA L.

1. *candicans* Ait.—P.E., Bolus 3054; Redhouse; near Uit., Schlechter 2507; foot of Witteklip. Var. β *discolor* Harv.—Uit.
2. *cavanillesiana* E. et Z.—Redhouse.
3. **conglomerata* E. et Z.—Near Sundays and Zwartkops Rs.
4. **filifolia* Linn.—P.E.

†5. *flammea* Jacq.—P.E.; Redhouse; Uit.

6. **holosericea* Jacq.—Uit.
7. *latifolia* E. et Z., var.—Redhouse.
8. *linifolia* L.—Sandy dunes, P.E., Bolus 2225.

†9. **hyssopifolia* L.—Uit.

10. *mucronulata* Turcz—Van Stadens.
11. **pallens* E. et Z.—Uit.
12. **pulverata* And.—Uit.; Sundays R.

†13. *salvifolia* L.—P.E.; Bethelsdorp; Uit.

14. *stipulacea* Lehm.—Van Stadens, Bolus 2266.
15. *suavis* Presl—Redhouse; Cradocktown, near P.E., Bolus 1888; Aloes; Sundays R.
16. *sulcata* Harv.—Redhouse; near P.E.

‡17. *velutina* DC.—P.E., J.L.D.; Redhouse; Uit.; Kamaehs.

‡18. *saccifera* Turcz (= *Mahernia ovalis* Turcz)—P.E.; near Zwartkops R.; Green Bushes.

19. *pilosula* (Harv.).—Redhouse; P.E.
20. *pulchella* (Cav.).—Redhouse; P.E.

†21. *scabra* (E. et Z.).—Zwartkops and Sundays Rs.; New Brighton; Cradocktown, near P.E., Bolus 13402.

‡22. *veronicaefolia* (E. et Z.).—Bethelsdorp, T.V.P. 114; Uit.

MELHANIA Forsk.

‡1. **didyma* E. et Z.—Zuurberg Range; Winterhoeksberg, near Van Royen on the Coega R.

DOMBEYA Cav.

‡1. **Dregeana* Sond.—Uit.

GUTTIFERAE (incl. HYPERICINEAE).

HYPERICUM L.

‡1. *Lalandii Chois.*—Van Stadens Mts., Bolus 1610.

2. **aethiopicum* Thunb.—Uit.

OCHNACEAE.

OCHNA Schreb.

‡1. *atropurpurea* DC.—Redhouse, Mar.; Van Stadens, Sept.; Bethelsdorp, June; P.E., June.

‡2. **arborea* Burch.—Uit.

ELATINACEAE.

BERGIA L.

1. **glomerata* Linn. f.—In wet places near the Zwartkops R.

FRANKENIACEAE.

FRANKENIA L.

1. *hirsuta* L. (*capitata* Wedd.), var. *Krebsii* Harv.—Redhouse; Uit., Z. 1060. Var. *laevis* Harv. (*F. laevis* L.)—Mouth of the Zwartkops R., Jan., Z. 663.
2. **pulverulenta* Linn.—Zwartkops R.

VIOLACEAE.

HYBANTHUS Jacq. (IONIDIUM Vent.)
- ‡1. *capense* (R. et Sch.)—P.E.; Uit.

FLACOURTIACEAE (BIXACEAE).

KIGGELARIA L.
- ‡1. *Dregeana* Turcz—Uit.

SCOLOPIA Schreb.
- †‡1. *Mundtii* Arn.—Uit.; at the edge of Van Stadens forest, Z. 3785.
- ‡2. **Ecklonii* Arn.—Van Stadens Mts.
- ‡3. **Zeyheri* Arn.—Uit.

DORYALIS Arn. et Mey. (= DOVYALIS)
1. *rhamnoides* Burch. et Harv.—Springfields.
2. *rotundifolia* Thunb.—Bethelsdorp; P.E.; Redhouse.

TRIMERIA Harv.
1. *trinervis* Harv.—Van Stadens Mts., MacOwan 903, Z. 724.

ACHARIACEAE (usually placed under PASSIFLORACEAE).

CERATIOSICYOS Nees
- ‡1. *Eckloni* Nees—Baakens R. valley, May; woods of Uit.

ACHARIA Thunb.
1. *tragioides* Thunb.—Van Stadens, Sept.; Uit.; kloof near P.E.

§CACTACEAE (various species of *Opuntia* L. naturalized).

PENAEACEAE.

PENAEA L.
- †1. **mucronata* L.—Van Stadens R.
- †2. *ovata* E. et Z.—Van Stadens; Elands R., Mar.
- †3. **myrtoides* L.—Elands R. Mts.
- 4. **myrtifolia* Endl.—Uit.
- †5. **Cneorum* Meerb.—Uit. div.

OLINIACEAE.

OLINIA Thunb.
- †‡1. *cymosa* Thunb., var.—Bethelsdorp and P.E., Oct.; Van Stadens. Var. *acuminata*—P.E., Sept.; Uit.

THYMELAEACEAE (excerpted from the "Flora Capensis," as the Albany Museum specimens are at Kew).

PASSERINA L.
- 1. *falcifolia* C. H. Wr.—In the channel of the Zwartkops R.; Van Stadens Mts.
- †‡2. *filiformis* L.—Drift sands, P.E.
- †‡3. *ericoides* L.—Sand-hills and rocky shores near P.E.
- †‡4. *rigida* Wikstr.—Shore near P.E.; Kraggakamma; Zwartkops R.

LACHNAEA L.
1. *diosmoides* Meisn.—Van Stadens Mts., 800 ft.

STRUTHIOLA L.

†1. *striata* Lam.—Uit. div.
2. *ovata* Thunb.—Van Stadens Mts. and to Kraggakamma.
3. *tuberculosa* Lam.—Uit. and Kraggakamma.
4. *parviflora* Bartl.—Uit. ; Zuurberg.
†5. *lucens* Lam.—Near P.E.
6. *argentea* Lehn.—Between Kraggakamma and Van Stadens.

GNIDIA L.

†1. *oppositifolia* L.—Uit.
2. *styphelioides* Meisn.—Van Stadens to P.E.
3. *variegata* Gandog.—P.E.
4. *coriacea* Meisn.—Van Stadens Mts. and between Enon and Driefontein.
5. *thesioides* Meisn.—Near Uit. ; Addo.
6. *obtusissima* Meisn.—Between Sunday and Coega Rs.
†7. *polystachia* Berg.—P.E. to Uit.
‡8. *nodiflora* Meisn.—Uit.
†9. *sericea* L.—Uit.

LASIOSIPHON Fresen.

‡1. *linifolia* Decne.—On plains near Uit. ; Addo ; Zuurberg Range.
‡2. *anthylloides* Meisn.—Van Stadens Mts. and thence to P.E.
‡3. *meisnerianus* Endl.—Uit. div.
4. *oblongifolius* Gandog. (imperfectly known).—P.E. div.

LYTHRACEAE.

LYTHRUM L.

†1. §*hyssopifolium* L.—Baakens R. valley, Jan. ; Uit.

COMBRETACEAE.

COMBRETUM L.

‡1. *salicifolium* E. Mey.—Van Stadens, MacOwan 1088 ; Uit. ; Redhouse, July.

MYRTACEAE.

EUGENIA L.

‡1. *Zeyheri* Harv.—Springfields, Nov. ; P.E. ; woods on Van Stadens R.
‡2. *capensis* Harv.—Zwartkops R. mouth, Mar.

OENOTHERACEAE.

OENOTHERA L.

†1. §*nocturna* Jacq.—Redhouse, Oct.
2. §*speciosa* Nutt.—P.E., Nov.
†3. §*odorata* Jacq.—Walmer, July.

EPILOBIUM L.

†‡1. §*hirsutum* L.—On the banks of the Zwartkops R., June, Z. 545 ; Van Stadens, Dec.
†‡2. *§*tetragonum* L.—Zwartkops R.

HALORRHAGIDACEAE.

LAUREMBERGIA Berg. (SERPICULA Linn.)

†‡1. *repens* L.—Frames Drift, Mar.; Zwartkops R., Jan., Bolus 1521.

GUNNERA L.

1. **perpensa* L.—Kraggakamma (*teste* Ecklon).

MYRIOPHYLLUM L.

‡1. **spicatum* L.—Zwartkops R.

ARALIACEAE.

CUSSONIA Thunb.

‡1. *spicata* Thunb.—Elands R., Dec.; P.E., Nov.

†2. *thyrsiflora* Thunb.—Walmer, Oct.; P.E.; Zwartkops R. mouth; Uit.

UMBELLIFERAE.

HYDROCOTYLE Tourn.

†1. *verticillata* Thunb.—Despatch, Apr.; Redhouse, May; banks of Zwartkops R., Z. 434.

†‡2. *asiatica* L.—Redhouse, May; Frames Drift, P.E., Mar.; Van Stadens R., Zuurberg.

3. *hermanniaefolia* E. et Z.—Humewood, Apr.; P.E.; Walmer; Van Stadens R. Var. *littoralis*—Walmer, Nov.; Humewood, Mar.

4. *debilis* E. et Z.—Van Stadens; Walmer, Aug.

†5. *virgata* L.—P.E., June; Humewood, Apr.; Springfields; Van Stadens, Oct., MacOwan 1063, Schlechter 6071; Addo.

†6. *eriantha* Rich.—Van Stadens, Jan., Bolus 1613.

ALEPIDEA La Roche.

†1. *ciliaris* La Roche.—Van Stadens Mts., Nov.; Baakens R. Valley, Apr.; Uit., Z. 700, E. and Z. 2187.

APIUM L.

1. *decumbens* E. et Z.—Redhouse, Apr.; P.E.; Schoenmaakers Kop, Apr.

†‡2. *graveolens* L.—Redhouse, Mar.

TRACHYSPERMUM Link

†1. *rigens* E. et Z.—Hills near the Zwartkops R., Z. 2197, 1047.

CARUM Linn.

†1. *capense* Sond.—Redhouse, June.

†2. *hispidum* Benth. et Hook. (= *Ptychotis hispida* Sond.)—Redhouse, Sept.; Baakens R. Valley, Nov.

PIMPINELLA L.

1. **stadensis* Harv.—Van Stadens Mts.; Zuurberg.

SIUM L.

†‡1. *Thunbergii* DC.—Schoenmaakers Kop, Apr.; in beds of Zwartkops R., Z. 518.

RHYTICARPUS Sond.

1. *rugosus* Sond.—By the Zwartkops R., Z. 535, 2371; Redhouse, Feb.

BUPLEURUM L.

‡1. *Mundtii* Ch. et Sch.—Humewood, Oct.; Zwartkops.
2. *difforme* L.—P.E. Valley, Jan.; Van Stadens, Z. 2202; Zuurberg.

HETEROMORPHA Cham. et Schlecht.

‡1. *arborescens* Ch. et Sch.—Frames Drift, Mar.; P.E., Dec.; Addo and Zwartkops R., Z. 2203, 2204, 581.

LICHTENSTEINIA Cham. et Schlecht.

1. **latifolia* E. et Z.—Van Stadens Mts.; Uit.
2. *interrupta* E. Mey.—Schoenmaakers Kop, Apr.; Redhouse, Mar.; Van Stadens, MacOwan 1078; Zwartkops R., Z. 580, 2212.

ANNESHORHIZA Cham. et Sch. (= STENOSEMIS E. Mey.)

‡1. *caffra* (Sond.).—Van Stadens, MacOwan 1041.
†2. *macrocarpa* E. et Z.—Sand-hills on Zwartkops R., Z. 584; Redhouse, May.

FOENICULUM Adans.

†1. §**officinale* All.—Hills near Zwartkops R. and Van Stadens R.

PITURANTHOS Viv. (DEVERRA DC.)

1. *aphylla* (DC.)—Uit.

SESELI L.

1. **caffrum* Meisn.—Addo.

CNIDIUM Cuss. (SELINUM L.)

‡1. *suffruticosum* Ch. et Sch.—P.E. beach, Dec.; Walmer, Oct.; near mouth of Zwartkops R., Z. 2686.

PEUCEDANUM Koch

‡1. *capense* Sond., var. *latifolium*—Bethelsdorp, Nov.
2. *Ecklonianum* Sond.—Elands R., Z. 934.
3. **capillaceum* Thunb.—Van Stadens R.
†4. **ferulaceum* Thunb., var. *stadense*—Van Stadens Mts.
5. *cynorhiza* Sond.—Zwartkops R., Z. 2693.
6. *Zeyheri* Sond.—Redhouse, Mar.

CAPNOPHYLLUM Gaertn.

†1. ? *africanum* Koch—Redhouse, Dec., T.V.P. 396 (specimen poor).

CAUCALIS L. (TORILIS Adans.)

†1. C *africana* (Spr.) (= *Torilis africana* Spr.)—Near Zwartkops R., Oct., Z. 488.

ARCTOPUS L.

†1. *echinatus* L.—P.E., June and July, Bolus 2247; Redhouse, July.

CONIUM L.

1. **chaerophylloides* E. et Z.—Uit.

HERMAS Linn.

1. *ciliata* Linn.—Van Stadens Mts., Jan., MacOwan 1023, Bolus 1587.

CORNACEAE.

Curtisia Ait.
†‡1. *faginea* Ait.—Zuurberg.

METACHLAMYDEAE (SYMPETALAE).

ERICACEAE.

Erica L.
†1. *curviflora* L.—Van Stadens, Nov.; Redhouse, Mar.
2. *glandulosa* Thunb.—Van Stadens; Walmer; in the stony channel of the Zwartkops R., May, Z. 126.
3. *chloroloma* Lindl.—Redhouse, Apr.; Schoenmaakers Kop, Mar.; P.E., July.
4. *strigilifolia* Salisb.—Redhouse, Mar.; P.E., Mar.
5. *pectinifolia* Salisb.—Bethelsdorp, Sept.; P.E. Golf Links; Springfields; Van Stadens Mts.
†‡6. *cerinthoides* L.—Bethelsdorp, Nov.; P.E.; Zuurberg.
7. *tetragona* L. f.—Van Stadens, Oct.
†‡8. *caffra* L.—Zuurberg, Oct.
9. *cordata* Andr.—Uit.
10. *petraea* Benth.—Cockscomb, Apr.
11. *deliciosa* Wendl. f.—Thornhill, July; Van Stadens, Apr.
12. *decipiens* Spreng.—Van Stadens, Mar.; Baakens R. Valley, Jan.; P.E. Golf Links, May; Bethelsdorp, June; Zuurberg, Mar.
13. *demissa* Kl.—Van Stadens Mts.
14. *harveiana* Guthrie et Bolus—Van Stadens Mts.
15. *unilateralis* Kl.—Redhouse, June; Van Stadens Mts.
16. *coarctata* Wendl., var. *longipes*—Elands Kloof.
17. *arachnoides* Kl.—Van Stadens Mts.
18. *copiosa* Wendl.—Van Stadens Mts.
19. *glumaeflora* Kl.—Van Stadens Mts.; Humewood, June; Zuurberg, Oct.
20. *nabea* G. et B.—Van Stadens Mts.
21. *affinis* Benth.—In the stony channel of the Zwartkops R., Oct.
†22. *articularis* L.—Uit., Apr., E. and Z. 105.
†23. *calycina* L.—Van Stadens Mts., Jan., Oct.
24. *seriphiifolia* Salisb.—Van Stadens.
‡25. *cubica* L.—Van Stadens, Nov., Dec.
26. *nemorosa* Kl.—Redhouse, July; Bethelsdorp; Van Stadens Mts.
27. *floribunda* Lodd.—Elands R., Mar.; Zuurberg, Mar.
28. *melanthera* L.—Thornhill, July; Walmer; Van Stadens; July, E. and Z.; Walmer, Oct.
29. *Chamissonis* Kl.—Van Stadens, July; Zuurberg, Oct.
30. *longipes*, Thunb.—Grass ridge, Uit. div.
31. **Ethelae* L. Bolus (allied to *E. glandulosa*)—near P.E.

Blaeria L.
1. *grandis* N. E. Br.—Van Stadens Mts.
2. *fuscescens* Thunb.—Van Stadens Mts.

Coilostigma Kl.

1. *tenuifolium* Thunb.—Walmer, July; Van Stadens, July, 1000 to 3000 ft., E. and Z.; rocky places on Van Stadens Mts., Jan., Z. 3321.
2. *Zeyherianum* Kl.—Among shrubs on Van Stadens Mts., Jan., Z. 3236; between Kraggakamma and Van Stadens Mts., 500 to 1000 ft., July, E. and Z.; P.E., Aug., T.V.P. 1156.

The above two species do not seem to be sufficiently distinct to be kept separate. The amount of hairiness on the corolla in *tenuifolium* varies considerably; other characters also vary slightly.

Thoracosperma Kl.

1. *nanum* N. E. Br.—Van Stadens Mts.

Thamnus Kl.

1. *multiflorus* Kl.—Cockscomb, Apr.; Thornhill, July; Van Stadens.

Simocheilus Kl.

1. *barbiger* Kl.—Van Stadens Mts.; Witteklip, Jan.; Baakens R. Valley, Jan.; Redhouse, Apr.; Uit., Feb.
2. *pubescens* Kl.—Near the Elands R.

Anomalanthus Kl.

1. *discolor* Kl.—Hills near P.E., under 500 ft., Nov.

MYRSINACEAE.

Myrsine L.

†‡1. *africana* L.—Redhouse, Aug.

2. *gilliana* Sond. [= *Rapanea gilliana* (Sond.) Mez in "Pflanzenreich" 3, IV, 236, p. 376]—Redhouse, July; Humewood; P.E.; sand-hills between the mouths of the Coega and Zwartkops Rs.

†‡3. *melanophloeos* R. Br. (= *Rapanea melanophloeos* L.)—Redhouse, Mar.

PRIMULACEAE.

Lysimachia L.

1. **nutans* Nees—Between Hoffmann's Kloof and Driefontein, 1000 to 2000 ft.; Zuurberg Range, near Bontjes R.

Anagallis L.

†‡1. §*arvensis* L.—Redhouse, Oct.; P.E., Aug.

Samolus Linn.

†‡1. *Valerandi* L.—Redhouse, Apr.; P.E., Nov.

†‡2. *porosus* Thunb.—Redhouse, Oct.; P.E.

PLUMBAGINACEAE.

Statice Willd.

†1. *linifolia* L.—Redhouse, Oct. Var. *collina*.—Uit.; Zwartkops R., under 100 ft. Var. β.—On sand-hills near P.E., under 100 ft.

†2. *scabra* Thunb.—New Brighton; Coega; on hills near P.E. and dunes near Cape Recife up to 500 ft.

Plumbago Linn.

‡1. *capensis* Thunb.—Van Stadens, Sept.; Zuurberg.

SAPOTACEAE.

Sideroxylon L.

†‡1. _inerme_ L.—P.E., Mar., Aug. ; Redhouse ; Aloes.

EBENACEAE.

Royena L.

‡1. _cordata_ E. Mey.—Bethelsdorp, Sept.
‡2. _pallens_ Thunb.—P.E., Sept. ; Redhouse.
3. _lycioides_ A. DC.—Despatch, Apr. ; Redhouse, Dec. ; P.E., Aug.

Euclea Murr.

1. _polyandra_ E. Mey.—Redhouse, Mar. ; Van Stadens Mts.
2. *_acutifolia_ E. Mey.—Between Kromme R. and Uit.
‡3. _lanceolata_ E. Mey.—Van Stadens Mts. ; between Zwartkops and Sundays Rs.
‡4. _multiflora_ Hiern—Bethelsdorp, June ; Zwartkops R. ; Addo Hills.
‡5. _daphnoides_ Hiern—Uit. ; by the Baakens R.
†6. _racemosa_ L.—Redhouse, Mar.
7. _undulata_ Thunb.—Redhouse, July.

OLEACEAE.

Jasminum L.

‡1. _angulare_ Vahl—P.E., Jan. ; Redhouse, Oct. ; Uit. ; between Enon and the Zuurberg Range ; Addo.
‡2. *_multipartitum_ Hochst.—Uit. div., Sandfontein.

Olea Linn.

‡1. *_foveolata_ E. Mey.—Near Uit. ; Addo.
†‡2. _verrucosa_ Link—Humewood, Jan. ; Redhouse, Oct. ; Springfields, Nov. ; Addo.
3. _exasperata_ Jacq.—P.E., Sept., Nov. ; Redhouse, Oct. ; Frames Drift, Mar. ; Addo.
†‡4. _capensis_ L.—P.E.
‡5. _laurifolia_ Lam.—Van Stadens R. ; P.E. div., sand-hills by the seashore.
6. _sp._—Uit., Jan., T.V.P. 2214.

O. humilis Eckl., published in his "List of Plants Found in the District of Uitenhage," _S.A. Quart. Journ._, 1830, p. 370, is, judging from the description, the same as _O. exasperata_ Jacq.

SALVADORACEAE.

Azima L.

1. _tetracantha_ Lam.—Redhouse, Nov.

LOGANIACEAE.

Gomphostigma Turcz

1. *_scoparioides_ Turcz—By the Sundays and Coega Rs.

Nuxia Lam.

‡1. _floribunda_ Bth.—Van Stadens, Aug. ; Kraggakamma, E. and Z. ; Zwartkops R.

Chilianthus Burch.

1. _arboreus_ A. DC.—Between Galgebosch and Melk R. ; Van Stadens R. ; on banks of Zwartkops and Bushmans Rs.
2. *_dysophyllus_ A. DC.—Uit. div.

BUDDLEIA L.

1. **salvifolia* Lam.—Between Galgebosch and Melk R.; banks of the Zwartkops R.

STRYCHNOS L.

1. **Atherstonei* Harv.—Kraggakamma.

I do not know which plant Ecklon means by his *Logania capensis* (*S.A. Quart. Journ.*, 1830, p. 371), found in the woods of the Zuurberg, near Bontjes River at an altitude of 1000 ft. It flowers in Nov. The diagnosis is not detailed enough to recognize the genus. It is a shrub with trichotomous four-angled branches and is briefly characterized as follows: "Foliis ovatis-oblongis perfoliatis utrinque laevibus corymbis terminalibus trichotomis."

GENTIANACEAE.

SEBAEA Soland.

†1. *minutiflora* Schinz—Humewood, Oct.; Walmer, Oct.
2. *sedoides* Gilg—P.E., Sept.
3. *Zeyheri* Schinz—P.E., Aug.
4. *macrostigma* Gilg—Van Stadens, Oct.
‡5. *crassulaefolia* Cham.—Van Stadens.
6. **fastigiata* A. W. Hill—Van Stadens Mts.
7. *Dregei* Schinz—Van Stadens, Nov.; Zuurberg, Mar.
8. *pseudobelmontia* Schinz *n. sp.*—Humewood, Sept., T.V.P. 1050. Does not seem distinct from *S. intermedia* Schinz.

CHIRONIA L.

†‡1. *baccifera* L.—Bethelsdorp, Jan.
‡2. *peduncularis* Lindl.—P.E. Valley; near Uit.
3. *serpyllifolia* Lehm.—Near Zwartkops R., below 100 ft. Var. *laxa* Gris.—Redhouse, Dec.
†4. *maritima* Eckl.—Redhouse, Apr.
5. *tetragona* L.—Frames Drift and Bethelsdorp; Van Stadens; P.E.; Humewood, Jan.
6. **melampyrifolia* Lam.—Van Stadens Mts.; near P.E.

VILLARSIA Vent.

†1. **ovata* Vent.—Zuurberg Range, 2500 ft.

LIMNANTHEMUM S. M. Gmel.

1. *thunbergianum* Griseb.—Springfields.

APOCYNACEAE.

CARISSA L.

‡1. *Arduina* Lam.—P.E. Valley, Sept., Nov.; Redhouse, Dec.; Zuurberg Range at Bontjes R.

There are two distinct varieties of this species, which Ecklon distinguished as two species in the Uit. dist. (see "On the Flora of Uitenhage," by Ecklon in *S.A. Quart. Journ.*, 1830, p. 372). One has blackish sour fruit, the other bears red edible fruit; the former was called *Arduina haematocarpa* Eckl., the latter *A. erythrocarpa* Eckl.

ACOKANTHERA G. Don

‡1. *venenata* G. Don—Springfields; Zuurberg; fruit in Jan.

GONIOMA E. Mey.
1. *Kamassi* E. Mey.—Van Stadens, Sept., Dec.; also in other forest patches.

PACHYPODIUM Lindl.
1. *bispinosum* DC.—Redhouse, Dec.; P.E.; Loerie R.
2. *succulentum* DC.—Redhouse, Dec.; Uit.; P.E., Feb.; Loerie R.

ASCLEPIADACEAE.

RAPHIONACME Harv.
1. *Zeyheri* Harv.—P.E., Nov.; Redhouse, Dec.

SECAMONE R. Br.
1. *Alpini* Schult.—P.E. Valley, Nov.; on the sand-hills along the coast; Van Stadens Mts.; near Uit.
2. *frutescens* Decne.—Redhouse, July, T.V.P. 1132; Uit., Schlechter 2532; Zuurberg Range on the Bontjes R.

ASTEPHANUS R. Br.
1. *marginatus* Decne.—Humewood, Apr.

MICROLOMA R. Br.
†1. *lineare* R. Br. (*M. tenuifolium* K. Schum.)—Bethelsdorp, Nov.; Baakens R.

WOODIA Schlechter
1. **mucronata* N. E. Br.—Uit.; Addo.

XYSMALOBIUM R. Br.
1. **Zeyheri* N. E. Br.—Van Stadens Mts.
2. *undulatum* R. Br.—Bethelsdorp, Sept.

SCHIZOGLOSSUM E. Mey.
1. *cordifolium* E. Mey.—P.E., Aug.; Van Stadens, Sept.
2. *linifolium* Sch.—Redhouse, Aug.
3. *heterophyllum* Sch.—Walmer, Oct.
4. *biflorum* Sch.—P.E., Nov.
5. *Bowkerae* N. E. Br.—Redhouse, Nov.
6. *addoense* N. E. Br.—Addo.

ASCLEPIAS L.
1. *expansa* Sch.—Zwartkops R.; Van Stadens Mts., Dec.
2. **peltigera* Sch.—Van Stadens Mts
3 ? *fruticosa* Linn.—Humewood, Apr., T.V.P. 2053 (poor specimen).
4. **physocarpa* Sch.—Zwartkops R.
5. *rotundifolia* Mill.—Bethelsdorp, June; Baakens R.
6. *dregeana* Sch.—Walmer, Sept.
7. *crispa* Berg—Van Stadens, Sept., Schlechter 6077; P.E., June; Redhouse, T.V.P., Nov.; sandy plains near Uit.
8. *albens* Sch.—Zuurberg, near Coerney.

PACHYCARPUS E. Mey.
1. *dealbatus* E. Mey.—Bethelsdorp, Jan.
2. *grandiflorus* E. Mey.—Van Stadens Mts.; Frames Drift, Mar.; near P.E.; round Uit.; near Addo.

Glossostephanus E. Mey.
1. *_linearis_ E. Mey.—Van Stadens R.

Pentarrhinum E. Mey.
1. *_insipidum_ E. Mey.—Near Enon; Klein Winterhoek.

Cynanchum L.
1. *_intermedium_ N. E. Br.—Near P.E.
†2. _africanum_ R. Br., var. _crassifolium_ N. E. Br.—Humewood, July; P.E., Feb.; Redhouse, Apr.; Uit.
†3. _obtusifolium_ L.—P.E., Oct.; near Uit.; P.E., Feb.; Redhouse, Apr.; Uit.
4. _capense_ Thunb.—Van Stadens, Sept.; amongst shrubs near Uit.
5. _sarcostemmatoides_ K. Schum.—Redhouse, Aug.; Despatch; hills between Zwartkops and Sundays Rs.; near Uit.

Sarcostemma R. Br.
1. _viminale_ R. Br.—Redhouse, Oct.; Despatch; Uit.; Addo.

Tylophora R Br
1. _umbellata_ Sch.—Springfields, Jan.
2. *_badia_ Sch.—Uit div.
3. *_syringaefolia_ E. Mey.—Galgebosch.
4. *_lycioides_ Decne.—Near Enon.

Marsdenia R. Br.
1. *_floribunda_ N. E. Br.—Zuurberg Range.

Fockea Endl.
1. _glabra_ Decne.—Redhouse, Mar., Nov.; Uit.; near the Zwartkops saltpan.

Tenaris E. Mey.
1. *_rubella_ E. Mey.—Addo.

Ceropegia L.
1. _stapeliaeformis_ Haw.—Redhouse, Oct.
2. _carnosa_ E. Mey.—Redhouse, Apr.; Uit., 300 ft. Schlechter 2494.
3. _hastata_ N. E. Br.—Redhouse, June; Bethelsdorp, June.
4. _Patersoniae_ N. E. Br.—Redhouse, Sept., June.
5. _Schonlandii_ N. E. Br.—Redhouse.

Brachystelma R. Br.
1. _decipiens_ N. E. Br.—Redhouse, Sept.
2. *_Schonlandianum_ Sch.—Dry stony places in a valley near Uit.
3. *_comptum_ N. E. Br.—Hills by the Zwartkops R.
4. *_Zeyheri_ N. E. Br.—Near Uit.; stony places near the Zwartkops R.
5. *_undulatum_ N. E. Br.—In fissures of rocks at Tzamas, near Uit., 400 ft.

Anisotoma Fenzl
1. *_cordifolia_ Fenzl—Van Stadens Mts.

HUERNIA R. Br.

1. *barbata* Haw.—Sundays R., north of Uit., Apr.
2. *primulina* N. E. Br.—Redhouse, May.
3. *Thureti Cels.*—P.E., Mar.

STAPELIA L.

1. *desmetiana* N. E. Br.—Near Zwartkops Station, June; Zuurberg, Mar.
2. *ambigua* Mass.—Barkly Bridge Station.
3. *grandiflora* Mass.—Redhouse, May; P.E., Jan.
4. *conformis* N. E. Br.—Cockscomb Mts.
5. *verrucosa* Mass.—P.E., Mar., Apr.; Bethelsdorp, Nov.
6. *pulchella* Mass.—Near the banks of the Zwartkops R., in the vicinity of Zwartkops Station; sand-dunes along the coast south of Port Elizabeth.
7. *sp.*—P.E., Jan., J.L.D. 565.

DUVALIA Haw.

1. *Pillansii* N. E. Br.—Redhouse, June.
2. *Corderoyi* N. E. Br.—Redhouse, Mar., June.
3. *elegans* Haw.—P.E., Mar.
4. *reclinata* Haw.—Redhouse, Mar.
5. *hirtella* Sw., var.—Redhouse, Aug.

CONVOLVULACEAE.

IPOMAEA L.

‡1. *simplex* Thunb.—Redhouse, Mar.; between Loerie R. and Galgebosch.
‡2. *biloba* Forsk.—Baakens R. valley, Jan.
‡3. *ficifolia* Lindl.—Redhouse; Uit.; Addo; between Enon and the Zuurberg Range; Klein Winterhoek Mts., below 1000 ft.
‡4. *palmata* Forsk.—Emerald Hill, Mar.

CONVOLVULUS L.

‡1. *hastatus* Thunb.—P.E., Oct.; Bethelsdorp, Sept.; Redhouse, June, T.V.P. 1088 (has larger flowers than the type).
2. **multifidus* Thunb.—Uit. div., near Loerie R.; Grassridge, near Uit.
3. *filiformis* Thunb.—Near the Zwartkops R.; "T.V.P. 146, from the P.E. Valley, has the angular stem of *C. hastatus* Thunb., but the villous sepals of *C. filiformis*."—L. B.
‡4. *farinosus* L.—Uit., Apr.
‡5. *capensis* Burm., var. *plicatus*—P.E., May.

DICHONDRA Forst.

†‡1. *repens* Forst.—P.E., Oct.

FALKIA L.

†1. *repens* L. f.—Redhouse, Aug.; P.E., Oct., Nov.
2. **dichondroides* Bak.—Near Enon, below 1000 ft.

CUSCUTA Tourn.

†1. **africana* Thunb.—At the foot of the Van Stadens Mts.
2. §*chinensis* Lam. (*fide* Kew)—Redhouse, Apr.

BORAGINACEAE.

Cordia L.
‡1. **caffra* Sond.—Van Stadens R.

Ehretia L.
‡1. *hottentotica* Burch.—P.E., Oct.; Redhouse, Apr., Sept.; Uit., 50 to 500 ft.; in the forests of Addo; Enon; Zuurberg, Mar.

Heliotropium L.
1. *currassavicum* L.—Redhouse, Nov.; Uit., 50 to 500 ft., Oct.
2. **ovalifolium* Forsk.—Enon.
3. **supinum* L.—Valley of the Zwartkops R.

Cynoglossum L.
†‡1. *§*enerve* Turcz—Near Uit.
‡2. *§*micranthum* Desf.—Van Stadens Mts., under 1000 ft.

Echinospermum Swartz
1. §*Lappula* Lehm.—Redhouse, Aug.; on the hills by P.E. and by the Zwartkops R.

Anchusa L.
1. *capensis* Thunb.—P.E., Dec.

Myosotis L.
1. *intermedia* Link.—Van Stadens, Oct.

Lithospermum L.
1. *papillosum* Thunb.—Zuurberg, Oct.
2. **scabrum* Thunb.—Zuurberg.

Lobostemon Lehm.
†1. *argenteus* Buek—Uit., Oct.
2. **trigonus* Buek—Between Coega and Sundays R.; Zuurberg Range.
3. *obtusifolius* DC.—P.E., Sept. to Nov.; Redhouse, Sept.; Coega, Oct.
4. **scaber* DC.—Van Stadens Mts.; Algoa Bay; near Uit.
5. **sphaerocephalus* Buek—Van Stadens Mts.

Echium L.
1. §*violaceum* L.—P.E., Oct.
2. §*sp.*—Redhouse, Dec., T.V.P. 227.

VERBENACEAE.

Stilbe Berg
1. **ericoides* L.—Algoa Bay.
2. *sp.—? phylicoides* A. DC.—Cape Recife, Jan., T.V.P. 1939.

Lantana L.
‡1. *salvifolia* Jacq.—Redhouse, Mar.; Aloes, Sept.; Uit., 50 to 500 ft.

Bouchea Chamisso
‡1. *cuneifolia* Schauer—Redhouse, Sept.

Priva Adans.
1. **leptostachya* Juss.—Grassy mountainous places near Enon.

Verbena L.
†‡1. §*bonariensis* L.—Redhouse, Mar.

LABIATAE.

BECIUM Lindley.

1. *burchellianum* N. E. Br.—Near Uit.; Hougham Park, Coega, May.

PLECTRANTHUS L'Herit.

1. *spicatus* E. Mey.—Hill flats near Bethelsdorp; Kamaehs, June.
2. **laxiflorus* Benth.—Uit.
3. *Thunbergii* Benth.—Near Uit., Schlechter 2501; woods of Addo and by the Zwartkops R.
4. *strigosus* Benth.—Redhouse, Aug.; Gamtoos R., July.
5. *hirtus* Benth.—P.E., Jan.; near Uit., Schlechter 2599.

MENTHA L.

1. **longifolia* Huds., sub-sp. *capensis* Briq.—Uit. div., by the Witte R. near Enon.

†‡2. **aquatica* L.—Around Kraggakamma.

SALVIA L.

†1. *aurea* L.—Humewood, Oct.; Schoenmaakers Kop, Oct.
2. **rugosa* Thunb.—Hills of Uit.
3. *clandestina* L.—P.E., Oct.; North End Hill, P.E., Sept.
4. *scabra* L.—Van Stadens R.; P.E.; New Brighton.
5. **triangularis* Thunb.—Enon.

‡6. **obtusata* Thunb.—Valley and hills of the Zwartkops R., 50 to 500 ft.
7. **lasiostachys* Benth.—Uit. div.

‡8. *stenophylla* Benth.—Redhouse, Mar.
9. *runcinata* L.—Redhouse, Oct.; P.E., Nov.
10. *repens* Benth.—Zuurberg Range.
11. **rudis* Benth.—Zuurberg Range.

STACHYS L.

†1. **Thunbergii* Benth.—Van Stadens Mts.
2. *tubulosa* MacOwan—Zuurberg, Schlechter 6605.

†3. *aethiopica* L.—Van Stadens Mts.; P.E., June; Redhouse, Apr., Aug.; near Uit., 300 ft., Apr., Schlechter 2502.
4. *scabrida* Skan—Van Stadens Mts.; Baakens R. valley; Zuurberg.
5. *subsessilis* Burch.—Redhouse, Oct.; Cradockplace, P.E.; 100 ft.; between Kraggakamma and Van Stadens, 500 to 1000 ft., Dec.
6. **Priori* Skan—Algoa Bay.
7. **hyssopioides* Burch.—Zwartkops R., 1500 to 3000 ft., Dec.
8. *obtusifolia* MacOwan—Schoenmaakerskop.
9. *leptoclada* Berg.—Zuurberg.

MARRUBIUM L.

1. §*vulgare* L.—Addo.

BALLOTA Linn.

1. **africana* Benth.—Olivenhout Kloof, near Enon.

LEUCAS Burm.

1. *martinicensis* R. Br.—Redhouse, Aug.

LASIOCORYS Benth.

1. *capensis* Benth.—P.E., Oct.; Redhouse, Dec.; Cradockplace, 100 ft., May; Uit., 50 to 500 ft., Jan., 300 ft., Apr., Schlechter 2486.

LEONOTIS R. Br.

†‡1. *Leonurus* R. Br.—Elands R.; P.E., May, Zuurberg.
2. *Leonitis* R. Br.—P.E., Aug., J.L.D.; Van Stadens Mts.; between Van Stadens Mt. and Bethelsdorp; Addo.
3. **mollis* Benth.—Addo; Zuurberg Range; banks of the Coega R.
‡4. *dysophylla* Benth.—Frames Drift, Mar.
‡5. *dubia* E. Mey.—Humewood, Aug.; Enon.
6. **intermedia* Lindl.—Algoa Bay.
7. **Westae* Skan—P.E.

TEUCRIUM L.

1. *africanum* Thunb.—P.E., Mar., Sept.; Redhouse, Dec.
‡2. *capense* Thunb.—Near Uit., 250 ft., Schlechter 2591.

AJUGA L.

1. **Ophrydis* Burch.—Zuurberg Range; Van Stadens Mts.

SOLANACEAE.

SOLANUM L.

†‡1. §*nigrum* L.—Redhouse, Mar.; Zuurberg.
†2. **aggregatum* Jacq.—Addo Bush and banks of Zwartkops R., 50 to 500 ft.
†3. *quadrangulare* Thunb.—Redhouse, Apr., Aug.; Schoenmaakers Kop, Apr.; P.E., Apr.
†4. *giganteum* Jacq.—Van Stadens Pass, at end near the lead mine; Zuurberg.
†5. *aculeastrum* Dun.—Zuurberg, Mar.
6. *rigescens* Jacq.—P.E., Nov.; Zwartkops R., 50 to 500 ft.; Enon.
†‡7. *sodomeum* L.—Walmer, Apr.; Redhouse, Mar.
‡8. **aculeatissimum* Jacq.—Van Stadens Mts., under 1000 ft.
†‡9. *tomentosum* L.—Redhouse, Dec.; P.E., Feb.
10. *sp.* [near *S. acanthoideum* E. Mey. (L. B.)]—Walmer, Apr., T.V.P. 1026.

PHYSALIS L.

1. *§*pubescens* L. (= *P. peruviana* Mill ?)—Addo.

WITHANIA Pauq.

†‡1. *somnifera* Dun.—Elands R., Nov.; P.E., Nov.; Zwartkops R., 50 to 500 ft.

LYCIUM L.

1. *campanulatum* E. Mey.—P.E.; Redhouse, Apr.
†2. *tetrandrum* Thunb.—Redhouse, Apr., Aug.; P.E., W.K. 76.
3. **oxycladum* Miers—Uit. div.
4. *tenue* Willd.—P.E., Oct.; Walmer, May; Redhouse, Aug.
5. **Kraussii* Dunal—Uit. div.
6. *cinereum* Thunb.—Redhouse, Mar.
†7. *? afrum*, var. *erectum*—Uit., Feb., E. and Z.
8. *sp.*—Redhouse, Apr., T.V.P. 674.

DATURA L.

†‡1. §*stramonium* L.—Schoenmaakers Kop, Apr., etc.

NICOTIANA L.

†‡1. §*glauca* Grah.—P.E., Jan.; Zuurberg.

CESTRUM L.

1. §*viride* Moric.—Grows spontaneously in gardens.

SELAGINACEAE (placed frequently under SCROPHULARIACEAE).

HEBENSTREITIA L.

‡1. *integrifolia* L.—Redhouse, Mar.; Bethelsdorp, Nov.; Humewood, Sept.

†2. *cordata* L.—Bethelsdorp, Jan.; Zwartkops R. and Van Stadens R. mouth; P.E.

DISCHISMA Choisy

†1. **erinoides* Sweet—P.E.

†2. *ciliatum* Choisy—P.E.; Walmer, Oct.

WALAFRIDA E. Mey.

1. *nitida* E. Mey.—Bethelsdorp, Sept.; Baakens R. valley, Aug.; P.E., Sept.; Thornhill, July; Van Stadens, Oct., E. and Z.; Earn Cliff, near P.E., 150 ft., May, Galpin 6354.
2. **zuurbergensis* Rolfe—Zuurberg Range, 2000 ft.
3. *Zeyheri* Rolfe—Redhouse, June.
4. *rotundifolia* Rolfe—Van Stadens, 500 to 1000 ft.; Frames Drift, Feb.; P.E., June, Dec.
5. *cinerea* Rolfe—P.E., Sept.
6. *MacOwani* Rolfe—Aloes, Sept.
7. *decipiens* Rolfe—Addo, 1000 to 2000 ft., July; on the hills above the Elands R.; Uit., etc.
8. *polycephala* Rolfe—Redhouse, Sept.
9. **witbergensis* Rolfe—Zwartkops R.
10. *micrantha* Rolfe—Uit., Nov.; Despatch, May; Aloes, Sept.; Cradockplace, P.E., 100 ft., May; Redhouse, Oct.
11. **squarrosa* Rolfe—Coega Kop.
12. *geniculata* Rolfe—Uit., 50 to 500 ft.; near Uit., Schlechter 2590; Redhouse, Oct.; foot of Witteklip.

SELAGO L.

1. *Forbesii* Rolfe—P.E., June; Humewood, Aug.; Drift Sands, P.E., Nov.
2. **canescens* L.—Near P.E.
3. *Zeyheri* Rolfe—Redhouse, June.
4. **luxurians* Choisy—Van Stadens Mt.
5. *Dregei* Rolfe—Emerald Hill, June; Cradockplace, P.E., May.
6. *glomerata* Thunb.—Springfields, Jan.; Kamaehs, Nov.

†‡7. *corymbosa* L.—Redhouse, Mar.; Uit., 50 to 500 ft., Jan.; Van Stadens Mts. and Bethelsdorp; Zuurberg.

8. *racemosa* Bernh.—Zuurberg, 5500 ft., Schlechter 6582 (from Uit. div. ?).
9. **herbacea* Choisy—Algoa Bay.
10. *decumbens* Thunb.—P.E., Nov.; Humewood, June.

SCROPHULARIACEAE.

APTOSIMUM Burch.

1. **depressum* Burch.—Foot of the Winterhoek Mts.

PELIOSTOMUM Benth.

1. **origanoides* E. Mey.—Winterhoek Mts.

ALONSOA Ruiz et Pavon

1. **peduncularis* V. Wettst.—In wooded gorges near Uit.

Diascia Link et Otto
1. *cuneata* E. Mey.—Redhouse, May.
2. *capsularis* Benth.—Addo; Zuurberg.

Hemimeris Linn. f.
†1. *montana* L.—P.E. Valley, Sept., Oct.; Humewood, Sept.

Nemesia Vent.
†1. *barbata* Benth.—Walmer, Nov.; P.E., Sept.
‡2. *floribunda* Lehm.—Walmer, Oct.; Redhouse, Sept.; Addo (Redhouse, Nov., T.V.P. 316—? a starved form of *N. floribunda* Bth.).
†‡3. *foetens* Vent.—Baakens R. valley, Feb., Sept.; Uit., Schlechter 2540.
‡4. **melissaefolia* Benth.—Near Uit.

Diclis Benth.
‡1. *reptans* Benth.—Zuurberg, Oct., March.

Halleria L.
†‡1. *lucida* L.—Van Stadens, Aug.; P.E., July; Zuurberg, Mar.
†2. *elliptica* Thunb.—Van Stadens, Sept.

Freylinia Spin.
1. *oppositifolia* Spin.—Springfields, Jan.
2. *undulata* Benth.—Zuurberg, Oct.

Manulea L.
1. *bellidifolia* Benth.—Redhouse, Oct.
2. *obovata* Benth.—P.E., June, Oct.; Humewood, Nov.; Walmer, Oct.; on the hills of Kraggakamma, Jan.
‡3. *parviflora* Benth.—Walmer, Miss E. M. Kensit in Herb. Bolus 6486.

Sutera Roth
1. **pauciflora* O. Kuntze—Kraggakamma.
2. *campanulata* O. Kuntze—Humewood, May; P.E., June; Despatch, June.
3. **intertexta* Hiern—Algoa Bay.
4. **halimifolia* O. Kuntze—Uit. div.
‡5. *polyantha* O. Kuntze—Near Uit., 250 ft., Apr., Schlechter 2538.
6. *marifolia* O. Kuntze—Van Stadens, Dec.; Springfields, Mar.
†‡7. *brachiata* Roth—Redhouse, Mar.
†8. **linifolia* O. Kuntze—Uit.
9. **cordata* O. Kuntze—Kraggakamma.
‡10. *pinnatifida* O. Kuntze—Redhouse, July; on hills of Addo; Bethelsdorp, Nov.; P.E. Valley, Nov.; near Uit., Schlechter 2589; amongst shrubs on the banks of the Zwartkops R., Jan. Var. *subcanescens*—Amongst the bushes near Zwartkops R.
11. *foliolosa* Hiern—Uit., 50 to 500 ft., Jan.; P.E., June.
12. **phlogiflora* Hiern—Zuurberg Range.
‡13. *atropurpurea* Benth.—Uit., Nov.; on hills of Addo.
14. *aspalathoides* Benth.—Uit., Feb.; between Coega and Sundays Rs., 500 to 5000 ft.
15. *microphylla* Hiern—Drift Sands, P.E., Sept., Nov.; Redhouse, July; Uit.
16. *argentea* Hiern—Baakens R. valley, Nov.; Bethelsdorp, Nov.

PHYLLOPODIUM Benth.

1. *cuneifolium* Benth.—On hills by P.E., Oct. ; Nov., E. and Z. 743 ; P.E., Nov. ; Schoenmaakers Kop, Apr. ; Redhouse, July ; Uit.

‡2. **bracteatum* Benth.—Banks of Zwartkops R. ; near Uit.

3. *diffusum* Benth.—Uit., Schlechter 2511.

†4. *capitatum* Benth.—P.E., Jan., July ; Humewood, Sept.

POLYCARENA Benth.

†1. **capillaris* Benth.—Uit. div.

ZALUZIANSKYA F. W. Schmidt

†1. *lychnidea* Walp.—Bethelsdorp, Sept.

†‡2. *capensis* Walp.—Humewood, Sept. ; Uit., Schlechter 2518 ; between Coega and Sundays Rs., 500 to 1000 ft.

3. **longiflora* Walp.—Van Stadens.

†4. *divaricata* Benth.—Sundays R., Sept.

5. *peduncularis* Benth.—Redhouse, Sept.

LIMOSELLA L.

†1. *capensis* Thunb.—P.E., Nov. ; Redhouse, Sept.

‡2. **grandiflora* Benth.—Zwartkops R.

ILYSANTHES Rafin.

†‡1. *riparia* Rafin.—Redhouse, Feb. ; in channel of Zwartkops R.

VERONICA Tournef.

1. §*Anagallis* L.—Uit. div., Z. 106 ; Zwartkops R.

MELASMA Berg

†‡1. *scabrum* Berg—Van Stadens, Jan., MacOwan 197 ; Kraggakamma ; P.E.

‡2. *capensis* Hiern—P.E., Nov. ; Redhouse, Aug., Sept. ; Uit.

†‡3. *sessiliflorum* Hiern—Frames Drift, Mar. ; P.E. ; Zuurberg, Mar.

STRIGA Lour.

‡1. *orobanchoides* Benth.—Near the Zwartkops R. ; P.E.

‡2. **Thunbergii* Benth.—Uit. ; Addo ; Van Stadens.

SOPUBIA Hamilt.

‡1. *simplex* Hochst.—Van Stadens, Dec.

BOPUSIA Presl

‡1. *scabra* Thunb.—Walmer and Frames Drift, T.V.P. 2178 ; Van Stadens, Nov.

BUCHNERA L.

‡1. *dura* Benth.—Walmer, Oct. ; Zuurberg.

CYCNIUM E. Mey.

‡1. *adonense* E. Mey.—Addo.

RHAMPHICARPA Benth.

‡1. *tubulosa* Benth.—Kraggakamma, Dec. ; marshy places in the channel of the Zwartkops R.

HARVEYA Hook.

†‡1. *purpurea* Hook.—Walmer, Oct. ; Redhouse, Oct., Dec. ; Uit., 50 to 500 ft., Nov.

2. **pauciflora* Hiern—Van Stadens Mts.

3. *hyobanchoides* Schlechter—Walmer, Oct. ; P.E., Aug. ; Bethelsdorp, Sept.

HYOBANCHE L.

†1. *sanguinea* Benth.—P.E., Sept. ; Redhouse, Oct., Nov.

BIGNONIACEAE.

TECOMARIA Spach

‡1. *capensis* Spach—Thickets near Zwartkops R., Schlechter 2592; Enon.

RHIGOZUM Burch.

1. *obovatum* Burch.—Coegakamma Kloof; near the Winterhoek Mts.; between Coega R. and Sundays R., 500 to 1000 ft.; common in the Addo Bush.

Ecklon (*l.c.*, p. 368) mentions *Martynia longiflora* Linn. from the hills near Uit. This name is a synonym of *Rogeria longiflora*, J. Gay, a plant which is not likely to occur in the Uit. dist. I cannot make any suggestion as to what other plant Ecklon may have meant.

GESNERIACEAE.

STREPTOCARPUS Lindl.

‡1. *Rexii* Lindl.—P.E., Dec.

LENTIBULARIACEAE.

UTRICULARIA L.

†1. *capensis* Spreng.—Van Stadens, Dec.
2. **Ecklonii* Spreng.—Near the mouth of the Zwartkops R.
‡3. **stellaris* Linn.—By the Zwartkops R.
4. *exoleta* R. Br.—Redhouse, Dec.

ACANTHACEAE.

THUNBERGIA L.

1. *capensis* Retz.—P.E., Nov.; between Van Stadens R. and Galgebosch; between Uit. and Drostdy Farm; between Kraggakamma and the upper part of the leadmine river.
‡2. *dregeana* Nees—Springfields, Nov.; Zwartkops R.; Sundays R.

RUELLIA R. Br.

‡1. **ovata* Thunb.—Enon.

CHAETACANTHUS Nees

‡1. *Persoonii* Nees—P.E., Aug.; Redhouse, May; Winterhoeksbergen, 1000 to 3000 ft., Jan.; near Uit., 300 ft., Schlechter 2545; between Van Stadens R. and Galgebosch; Loerie R.
‡2. *glandulosus* Nees—P.E.; Redhouse, Oct.

BLEPHARIS Juss.

‡1. *mollugínifolia* Pers.—Redhouse, Mar.
2. **Ecklonii* C. B. Cl.—On karroo-like hills by the Sundays R.
3. *hirtinervia* T. And.—P.E., July; Redhouse, Oct.
‡4. **pruinosa* Engl.—Uit.
5. *procumbens* Pers.—P.E., Jan., July; Redhouse, Aug., Oct.; by the Sundays and Coega Rs.

CRABBEA Harv.

1. **nana* Nees
2. **hirsuta* Harv.

Both these are recorded in the "Flora Capensis," V. 1, pp. 38, 39, from the Zuurberg Range just outside our area, the first also "between Galgebosch and Melk R., Burchell 4765 (?)," which would be in the Uit. div. and not in the Humansdorp div. as stated in the "Flora Capensis."

BARLERIA L.
1. *pungens* L. f.—Redhouse, Feb. ; Schoenmaakers Kop, Apr. ; Cradockplace, 100 ft., May ; New Brighton, Jan.
2. **irritans* Nees—By the Sundays R., 1000 ft. ; hills by the Zwartkops R.
‡3. *obtusa* Nees—P.E., June ; Schoenmaakers Kop, Apr. ; Springfields, Mar.
4. **jasminiflora* C. B. Cl.—Between Galgebosch and Melk R.

JUSTICIA L.
1. *capensis* Thunb.—Redhouse, Nov. ; Cannon Hill, Uit. ; near the mouths of the Coega and Zwartkops Rs. ; Addo, June.
2. *cuneata* Vahl—Redhouse, Aug.
‡3. *pulegioides* E. Mey.—Redhouse, Mar., Aug.
4. **mutica* C. B. Cl.—In wooded situations in Uit. div.
5. **orchioides* L.—Near P.E. ; near Enon ; Commando Kraal.

MONECHMA Hochst.
1. *incanum* C. B. Cl.—Redhouse and Schoenmaakers Kop, Apr.
2. **acutum* C. B. Cl.—Between Galgebosch and Melk R. ; near Uit.
3. *foliosum* C. B. Cl.—Near Roodeval.

ISOGLOSSA Oerst.
‡1. **ciliata* Lindau—Addo, Jan. ; amongst bushes by the Zwartkops R., E. and Z. 73.
‡2. *Ecklonian*a Lindau—Springfields, Mar.
3. **origanoides* Lindau—Johannes Kloof, between Enon and the Zuurberg Range.

PERISTROPHE Nees
1. **caulopsila* Presl—In thickets by the Sundays R.
‡2. *Hensii* C. B. Cl.—Despatch and Redhouse, Aug. and Sept.
3. **cernua* Nees—Uit. ; near the Zwartkops R.

HYPOESTES R. Br.
‡1. *aristata* R. Br.—P.E., Feb. ; Redhouse, Apr., T.V.P. 593 ; near Uit., 400 ft., Schlechter 2526, Schoenmaakerskop.
‡2. *verticillaris* R. Br.—Redhouse, Aug. ; Springfields, Mar. ; Kraggakamma Forest, under 500 ft., Feb.

DICLIPTERA Juss.
1. **capensis* Nees—Near Zwartkops R.

PLANTAGINACEAE.

PLANTAGO L.
†‡1. §*major* L.—Walmer, Dec.
‡2. *? dregeana* Presl—Probably T.V.P. 2230, from Baakens R. Valley, Jan., belongs to this species
†‡3 §*lanceolata* L.—Schoenmaakers Kop, Apr.
†4 *carnosa* Lam.—Redhouse, Mar. ; P.E. ; Cape Recife, Z. 955 ; Green Bushes, near P.E. ; Witteklip.
5. *sp.*—New Brighton, P.E., Oct., T.V.P. 2370 ; P.E., W.K. 118. Not in "Flora Capensis."

N.B.—A specimen (F.H.H. 136, Zuurberg, Mar.) is close to, if not identical with *P. cornuta* Gouar, which, according to the "Index Kewensis," equals *P. major.*

RUBIACEAE.

BURCHELLIA R. Br.
‡1. *capensis* R. Br.—Van Stadens, Sept.; Uit., Z. 2285.

GARDENIA Ellis
‡1. *Neuberia* E. et Z.—Zuurberg, May.
‡2. **Thunbergia* L.—Kraggakamma.
‡3. **Rothmannia* L.—Uit.

RANDIA L.
1. **rudis* E. Mey.—Enon.

OLDENLANDIA L. (= HEDYOTIS)
‡1. **caffra* E. et Z.—Uit., stony places near the Zwartkops R.
‡2. **thymifolia* Presl—Zwartkops.
‡3. *amatymbica* Hochst.—Zuurberg, Oct.
4. **capensis* Lam.—Near Enon.
5. **setifera* Sond.—Stony places near the Zwartkops R.

VANGUERIA Comm.
‡1. *macrocalyx* Sond.—Zwartkops R. and Winterhoeksmts.

PLECTRONIA L.
‡1. *obovata* Klotzsch—Redhouse, Mar.; Van Stadens Mts.; Addo.
†‡2. *ventosa* L.—Redhouse, Mar.; Walmer, Oct.
‡3. **spinosa* Klotzsch—Addo; Van Stadens.

PAVETTA Linn.
‡1. *caffra* Thunb.—P.E., Jan.; Addo, Z.
‡2. *lanceolata* Eckl.—Uit.; Kraggakamma.

PSYCHOTRIA L.
‡1. *capensis* (Sond.) (= *Grumilea capensis* Sond.)—Zuurberg, Oct.

HYDROPHYLAX Linn. f.
‡1. *carnosa* Sond.—Bethelsdorp, Jan.; P.E., MacOwan 1927; Cape Recife, Jan.

GALOPINA Thunb.
‡1. *circaeoides* Thunb.—Emerald Hill, Mar.

ANTHOSPERMUM L.
†1. *aethiopicum* L.—Perseverance, Aug.; Humewood, Oct.; Zuurberg.
†2. *ciliare* L.—P.E., June.
‡3. *lanceolatum* Thunb.—Theescomb, near P.E., Feb.
4. *paniculatum* Cruse—Winterhoeksberge; Kraggakamma; Van Stadens.

CARPACOCE Sond.
†1. **scabra* Sond.—Van Stadens.

RUBIA Linn.
1. *petiolaris* DC.—Humewood, Apr.; Redhouse, Apr.

GALIUM Scop.
†1. *asperum* Thunb.—Redhouse, Aug.; Uit., Oct.
†2. *tomentosum* Thunb.—Redhouse.

VALERIANACEAE.

VALERIANA L.

‡1. **capensis* Thunb.—Kraggakamma; Zuurberg.

DIPSACEAE

CEPHALARIA Schrad.

‡1. *attenuata* R. et Sch.—Van Stadens Mts., Jan., Bolus, 1586.

SCABIOSA L.

†‡1. *columbaria* L., var.—Bethelsdorp, Sept.; Van Stadens Mts., Jan.; Redhouse.

CUCURBITACEAE.

MELOTHRIA Cogn.

1. **cordata* Cogn. (= *Zehneria cordata* Sond.) —Uit
2. *hederacea* Cogn. (= *Zehneria hederacea* Sond.) *ex descr.*—Redhouse, Apr.

†‡3. *punctata* Cogn. (= *Z. scabra* Sond.)—Uit.; Humewood, July; P.E. Valley, Nov., Dec.

COCCINIA Wight et Arn.

1. *quinqueloba* Cogn. (= *Cephalandra quinqueloba* Schrad.)—Emerald Hill, Mar.; Zuurberg, Mar.; Uit.

CUCUMIS L.

†‡1. **africanus* Linn. f.—Uit.

2. *Zeyheri* Sond.—Redhouse, May; P.E., Jan.

†3. **myriocarpus* Naudin—Dist. of Uit.

KEDROSTIS Cogn. (CONIANDRA).

1. *digitata* Cogn.—Redhouse, Oct.; P.E.
   T.V.P. 526, Redhouse, has both the leaf-segments of *K. glauca* and also the narrow ones of *digitata*.
2. *africana* Cogn.—Redhouse, Oct.; Uit., Apr., Schlechter 2528; Zuurberg, Mar.; (? Despatch, J.L.D. 271).
3. *glauca* Cogn.—Coega.
4. *punctulata* Cogn.—Uit., Apr., Schlechter 2528.
5. **mollis* Cogn.—Near Uit.
6. **Zeyheri* Cogn.—Near Zwartkops R. Var. *angustiloba*—Uit.

†7. *nana* Cogn., var. *genuina* (= *Con. Thunbergii* Sond.).—Redhouse, Apr. Var. *latiloba*—P.E., Aug.; Redhouse, Oct.

CAMPANULACEAE.

LOBELIA L.

†1 **filicaulis* (Presl) (= *Metzleria filicaulis* Presl)—Zwartkops R.

2. **leptocarpa* Gr. (= *Parastranthus thermalis* Sond.)—Uit.
3. *hirsuta* Linn.—Van Stadens, Nov.
4. *tomentosa* L.—Bethelsdorp, Sept.; Van Stadens; Zuurberg; foot of Witteklip.

†‡5. *erinus* L., var.—Van Stadens, Sept.; Humewood, Sept.; P.E., June, Oct., Zuurberg.

†‡6. *anceps* Thunb.—Redhouse, Apr.; Uit., Schlechter 2585; P.E., Nov.

†7. *erinoides* Thunb.—Zwartkops R.; Zuurberg.

MONOPSIS Salisb.

1. *scabra* (Thunb.) (= *Lobelia scabra* Thunb. and *Drobrowskya scabra* A. DC.)—Schoenmaakers Kop; Redhouse; Uit., Schlechter 2559; Zuurberg. Var. *glabrata*—Zwartkops R.

MEZLERIA Presl

1. *depressa* Sond. (= *Laurentia radicans* Schonl.)—P.E., Nov.

LIGHTFOOTIA L'Herit.

†1. *rubens* Buek—Van Stadens Mts.; Bethelsdorp; P.E. Valley, Feb., T.V.P. 2692.
2. *cinerea* Sond.—Van Stadens, MacOwan 2080.
3. *denticulata* Sond. (= *L. capillaris* Buek)—Near Uit., Schlechter 2505.
4. *albens* Spreng.—P.E., Mar., Nov.; Redhouse, Oct., T.V.P. 294; Zuurberg.
5. *ciliata* Sond.—Thornhill, July; Van Stadens Mts.; Redhouse, Oct.; P.E.; Zuurberg.
6. *Buekii* Sond.—Zwartkops R.
7. **tenella* A. DC., var. *microphylla*—P.E.; Zwartkops R. Var. *fasciculata*—Uit. Var. *rigida*—Uit.

WAHLENBERGIA Schrad.

†1. *procumbens* A. DC.—Redhouse, Oct.
2. *oocarpa* Sond.—Sand-hills on the Zwartkops R.
‡3. *capillacea* A. DC.—Van Stadens Mts.; Zuurberg.
‡4. *undulata* DC.—Van Stadens, MacOwan 595; Bethelsdorp, Nov., T.V.P. 383; Schoenmaakers Kop, Apr.; Zuurberg.
†5. *arenaria* A. DC.—Redhouse, Oct., Dec.; Humewood.
6. **robusta* Sond.—Uit.

PRISMATOCARPUS A. DC.

1. *strictus* A. DC.—Redhouse, Feb.; Van Stadens, MacOwan 1083.
2. **campanuloides* Sond.—Sandy places on the Zwartkops R., and on the Winterhoeksberg, near Elands R.

ROELLA L.

1. **Ecklonianа* Buek—Uit.
2. **spicata* Linn.—Hills near the Zwartkops R., at Bethelsdorp.

CYPHIA Berg

‡1. *linarioides* Presl—P.E., May; near Uit., Schlechter 2517; Redhouse, Feb., foot of Witteklip.
2. *triphylla* Phillips—Redhouse, May, T.V.P. 466.
‡3. *sylvatica* Eckl.—P.E., May; Schoenmaakers Kop, Apr.; Zuurberg, Mar.
4. **undulata* Eckl.—Between Coega and Sundays Rs.; Elands R., May–June.

GOODENIACEAE.

SCAEVOLA L.

‡1. *Thunbergii* E. et Z. (= *Sc. Lobelia* Murr.)—Bethelsdorp, Jan.; Algoa Bay; mouth of the Zwartkops R.

COMPOSITAE.

VERNONIA Schreb.
‡1. *mespilifolia* DC.—Van Stadens, May, Sept.; forests of Uit.
‡2. *corymbosa* Less.—Van Stadens; P.E., Apr.; Uit., Jan.
‡3. *pinifolia* Less.—Bethelsdorp, Nov.

PLATYCARPHA Less.
‡1. *glomerata* Less.—Redhouse, Dec.; in the town of Uit., Jan., Bolus 2321.

CORYMBIUM L.
1. *latifolium* Harv.—Van Stadens Mts., Jan., Bolus 1539.
†2. *nervosum* Thunb.—Bethelsdorp, Nov.; P.E., Jan., Dec.; Van Stadens Mts., Z. 302 (sub. *C. filiformi* L., but with quite smooth stems); Van Stadens, Jan., Bolus 1540.
†3. *? *scabrum* L.—Uit.
4. *cymosum* E. Mey.—Van Stadens and Witteklip, Dec.

MIKANIA Willd.
‡1. **capensis* DC.—Van Stadens Mts.

AMELLUS Cass.
1. *strigosus* Less.—Redhouse, Dec.; Aloes, Sept.

MICROGLOSSA DC.
1. *mespiloides* Benth. et Hook.—Uit., Schlechter 2558; Zuurberg.

ANAGLYPHA DC.
1. **aspera* DC.—Between Coega and Zwartkops Rs., under 1000 ft.

ASTER L. (incl. DIPLOPAPPUS DC.).
‡1. *hispidus* Bak.—Van Stadens, Oct.
‡2. *muricatus* Less., var. *fascicularis* E. Mey.—Zuurberg, Mar.; woods near the Zwartkops R., Mar., Z. 86.
3. **Zeyheri* Less.—Van Stadens.
‡4. **erigeroides* Harv.—Uit.
5. *hyssopifolius* Berg—Redhouse. Var. *rigidulus* Harv.—Dist. of Uit.
6. *ficoideus* Harv.—Redhouse, Oct.; near the mouth of the Zwartkops R.
7. *echinatus* Less.—Redhouse, Apr.
8. **linifolius* Harv.—Uit.
9. **strigosus* Thunb.—Zwartkops R.
†10. *capensis* Less.—Redhouse, Oct.; Van Stadens, Sept., Oct., and E. and Z. 318; near Uit., Apr., Schlechter 2574.
†11. *aethiopicus* Burm.—Van Stadens Mts., E. and Z. 332; Redhill, Uit., Aug.
‡12. *filifolius* Vent.—Redhouse, Sept.; P.E., Sept.
‡13. *asper* (Thunb.).—P.E., June.
14. *laevigatus* Sond.—Van Stadens Mts., Jan.
15. *sp.* (agrees fairly well with MacOwan's specimen of *A. confusus* Harv., from Bruintjeshoogte, except that his specimen is more hairy).—Redhouse, July, T.V.P. 2676.

FELICIA Cass.

1. *rigidula* DC. (regarded as a var. of *Aster hyssopifolius* Berg in the "Flora Capensis"; *A. hyssopifolius* Berg = *Felicia angustifolia* Nees).—Redhouse, Oct., Nov., T.V.P. 330; near Uit., Apr., Schlechter 2499.
This species is mentioned in "Index Kewensis" under *Felicia angustifolia* Nees.

ERIGERON L.

1. §*linifolius* Willd.—Redhouse, Feb. (introduced).
†‡2. §*canadense* L.—Frames Drift, P.E., Mar., T.V.P. 1957 (introduced).
N.B.—The species found in South Africa require revision.

NIDORELLA Cass.

1. **mespilifolia* DC.—Uit.
‡2. *resedaefolia* DC.—Schoenmaakers Kop, Apr.; Redhouse, Mar.
‡3. *auriculata* DC.—Schoenmaakers Kop, Apr.; Redhouse, June.
4. **amplexicaulis* DC.—Van Stadens Mts.

CHRYSOCOMA Cass.

‡1. *tenuifolia* Berg—P.E., June; Redhouse, July; foot of Witteklip. Var. *microcephala* DC.—Between Coega and Sundays Rs., E. and Z. 1113.

PTERONIA L.

1. *baccharoides* Less.—Van Stadens; Frames Drift, Mar.; Uit.
2. *incana* Less.—P.E., Oct.; Zwartkops R., Sept.; Despatch; Uit., six miles west of town, Jan.
3. *paniculata* Thunb.—Redhouse, Nov.: foot of Elandsberg.
4. *membranacea* L.—On the hills by P.E.; Redhouse,; between Coega and Sundays Rs.
5. *elongata* Thunb.—P.E., Dec.; Redhouse, Sept.
6. *trigona* Phill.—Van Stadens, Jan.; between Kraggakamma and the upper part of the Leadmine R.
7. *stachelinoides* DC.—P.E.; Redhouse; Koegakammaskloof.

CONYZA Less.

†‡1. **pinnatilobata* DC.—Zwartkops R.
‡2. **obscura* DC.—Dist. of Uit.
‡3. *incisa* Ait.—Uit., E. and Z., Z. 500.
†‡4. *ivaefolia* Less.—P.E., June; Redhouse, Feb.

BRACHYLAENA R. Br.

‡1. *dentata* Less.—Van Stadens, Nov., MacOwan 2076, Z. 309.
‡2. *racemosa* Less.—Redhouse, Mar. and Jan.; Zwartkops R., Z. 481.
‡3. *elliptica* Less.—Dist. of Uit., Dec., MacOwan.
‡4. **discolor* DC.—Uit., Burchell.

TARCHONANTHUS L.

†‡1. *camphoratus* L.—Walmer, Aug.; Emerald Hill, Mar.; Van Stadens.
‡2. *minor* Less.—Redhouse, Oct.

PULICARIA Cass.
†‡1. *capensis* DC.—Redhouse, Apr.; near Zwartkops R., Z. 470, 2789, 2790, 359.
Both varieties described in the "Flora Capensis" are found in the Uit. dist.

IPHIONA Cass.
1. *baccharidifolia* B. et H.—Redhouse.

BIDENS L.
†‡1. §*pilosa* L.—A common weed.

IOCASTE E. Mey.
1. *acicularis* DC.—Uit.

PRINTZIA Cass.
†1. *Bergii* Cass.—Walmer, Aug.; P.E.; Redhouse.

MATRICARIA L.
‡1. *nigellaefolia* DC.—Redhouse; banks of water-courses, Uit., Jan., Bolus 1503; Sundays R.

PENTZIA Thunb.
1. **sphaerocephala* DC.—Uit.
‡2. *incana* O. K. (= *virgata* Less.)—Between Coega and Sundays Rs., Z. 775; Uit. Schlechter 2487.
3. *globifera* Hutch. (*Matricaria globifera* Fenzl)—Near Zwartkops R., Oct., E. and Z. 223; Redhouse, Oct.; P.E., Nov.

ADENOSOLEN DC.
1. **tenuifolius* DC.—Near Uit.

COTULA L. (incl. CENIA Commers.).
†1. *coronopifolia* L.—Schoenmaakers Kop, Apr.
2. **sororia* DC.—Uit.
3. **Zeyheri* Fenzl—Near Zwartkops R.
4. *heterocarpa* DC.—Redhouse, Aug.; Zuurberg.
5. *ceniaefolia* DC., var.—P.E., June.
†6. *turbinata* (Pers.).—P.E., June; Schoenmaakers Kop, Apr.; Redhouse; between Uit. and P.E., Sept., Bolus 1884.
7. *sericea* (DC.).—Schoenmaakers Kop; P.E.; Redhouse, Apr.

ERIOCEPHALUS L.
†1. *umbellulatus* DC.—Van Stadens, May; P.E., June, Bolus 2228; Redhouse, Sept.

ATHANASIA L.
‡1. *punctata* Harv.—Zuurberg.
2. *dimorpha* DC.—At the mouth of the Van Stadens R., MacOwan 1062.
3. **fasciculata* Harv.—Uit.
†4. *dentata* DC.—Walmer, Nov.; P.E.; Uit., Z. 840, 315.
5. *pinnata* E. Mey.—Elands R., Dec.

XANTHIUM L.
†‡1. §*spinosum* L.—Redhouse, Apr.

LEONTONYX Cass.
†1. *squarrosus* DC.—Van Stadens, Nov., Jan., H. Bolus 1623; Uit.; Zuurberg.
†2. *glomeratus* DC.—P.E.; on the hills of Addo and Kraggakamma, Z. 365.
†3. *spathulatus* Less.—Springfields, Jan.

HELICHRYSUM Vaill.

†1. *odoratissimum* Less.—P.E., Oct.; Walmer, Nov.; Van Stadens, Jan., MacOwan 1033; Bethelsdorp, Nov.
‡2. *umbraculigerum* Less.—Zuurberg.
‡3. *subglomeratum* Less.—Van Stadens, Jan., H. Bolus 1537.
4. *niveum* (L.) Less.—On the flats near the Winterhoek Mts., and on the hills of Addo, E. and Z. 338.
†‡5. *dasycephalum* O. Hoff. (*H. parviflorum* DC.)—P.E., Nov.; Schoenmaakers Kop, Apr., T.V.P. 562; between Coega and Sundays Rs., Z. 403; foot of Witteklip.
6. *anomalum* Less.—P.E., Aug.; Bethelsdorp, July, Sept. Var. *rufescens* DC.—Uit., Mar., E. and Z. 68; Zwartkops R., E. and Z. 53; Algoa Bay, Sept.; Zuurberg.
†‡7. *cymosum* (L.) Less.—Humewood, Apr.
8. ? *Zeyheri* Less.—P.E., Nov., W.K. 208 (undeveloped).
9. **pedunculare* DC.—Uit.; Bethelsdorp, Z. 879.
‡10. *allioides* Less.—Uit.; Van Stadens Mts., Jan., H. Bolus 1517.
†‡11. *nudifolium* (L.) Less., var. *pelopodium* (DC.) Moes.—Uit.; Van Stadens Mts., Jan., H. Bolus 1529; Zuurberg.
12 *Krebsianum* Less.—Van Stadens, Oct.
‡13 *quinquenerve* Less.—Van Stadens Mts., Jan., H. Bolus 1528.
14 *undatum* Less.—Bethelsdorp, Nov.; Van Stadens, Jan., Bolus 1311; P.E., Aug.
†15 *capitellatum* Less.—Witteklip, MacOwan 1069.
16 *rosum* (Berg) Less.—P.E.; Redhouse, July, Oct., Nov.; Uit., Nov., E. and Z., Apr., Schlechter 2876.
‡17. *rugulosum* Less.—Uit.
†‡18. *teretifolium* Less.—Redhouse, Sept.; Humewood, Sept.; Witteklip, Dec., MacOwan 1162. Var. *congestum* DC.—Hills of Addo, and near the Van Stadens Mts., E. and Z. 317; near P.E., Oct., E. and Z. 394; Uit., Nov., Dec., E. and Z.; Van Stadens Mts. and Palmiet R., Jan., H. Bolus 1535.
†‡19. *capillaceum* Less.—P.E., Feb.
†20. *rutilans* Less.—Redhouse, Oct.
21. *Leontonyx* DC.—Springfields, Jan.
†‡22. *ericaefolium* Less.—Redhouse, Dec.; Uit., Z. 400, 496, Jan., E. and Z.; Bethelsdorp, Jan.; P.E., Dr. Potts 305 (var. *albidulum* DC.); Van Stadens, MacOwan 2069; foot of Witteklip.
‡23. *caespititum* Sond.—P.E., Aug.
‡24. *leptolepis* DC.—Van Stadens, Oct.
†‡25. *declinatum* Less.—Redhouse, Oct.; Uit., 50 to 500 ft.
W.K. 1099, from P.E., has pappus to the outer florets and so should be *H. declinatum* Less., but otherwise it agrees with *Amphidoxa gnaphaloides* DC. var.
†‡26. *serpyllifolium* Less.—Van Stadens, Oct., Nov.
27. *felinum* Less.—Van Stadens, Jan., Bolus 1533, E. and Z. 339; P.E., Oct., Aug.
‡28. *petiolatum* DC.—Springfields, Jan.; valleys near Van Stadens R., Jan., Bolus 1530.
‡29. *setosum* Haw.—Redhouse, Mar.
30. *striatum* Thunb.—Van Stadens, Sept.; Witteklip, MacOwan 1065; P.E., Oct., Sept.; Walmer, Oct. Var. *glabrum*

HELICHRYSUM Vaill.—*continued.*

DC.—Uit., July. Var. *villosum* DC.—Channel of Zwartkops R., E. and Z. 158; Uit., Dec., E. and Z.; Van Stadens Mts., Jan., Bolus 1531.

31. *argenteum* Thunb.—Bethelsdorp, Sept.; P.E., Mar., Bolus 1672; Humewood, Sept.; dist. of Uit., Oct., E. and Z. 373; foot of Witteklip.
32. *recurvatum* Thunb.—Sundays R., Burchell 4216; Zwartkops, E. and Z. 416.
33. *sordescens* DC.—Humewood, Oct.; P.E., Jan., Bolus 9802.
‡34. *appendiculatum* Less.—Van Stadens, Jan., Sept., Oct., Bolus 1534; P.E., Nov., Dec.; Uit., Nov.
†35. *retortum* Thunb.—Bethelsdorp, Nov.
36. *xeranthemoides* DC.—P.E., June.
‡37. *squamosum* Thunb.—Van Stadens Mts., E. and Z. 702, Bolus 1536; Zuurberg.
†‡38. *foetidum* Cass.—Elands R., Dec.
‡39. *fulgidum* Willd.—Walmer, Dec.; on the hills of Addo, and by the Zwartkops R., E. and Z. 751; Uit., Nov.; Van Stadens Mts., Jan., Bolus 236.
†40. *vestitum* Less.—Uit., Jan.
†41. *gymnocomum* DC.—Valley of the Van Stadens R., Jan., Bolus 1532.

IFLOGA Cass.

†1. *polycnemoides* Fenzl—Zwartkops R., Oct., Z. 1023; Redhouse.

HELIPTERUM DC.

†1. *canescens* DC.—Thornhill, July.
2. *phlomoides* DC.—Van Stadens, Nov.; P.E., Aug.

GNAPHALIUM L.

†‡1. **undulatum* L.—Uit.
†2. *candidissimum* Lam.—Uit., 250 ft., Schlechter 2484.
3. *micranthum* Thunb.—Marshy places on Zwartkops R., Z. 1027; banks of Van Stadens R., Jan., Bolus 1538.
†4. *repens* L.—Hills near P.E., Z. 740.
†‡5. *luteo-album* L.—Zwartkops R. and Addo Z. 221; Redhouse; Uit., E. and Z. 1028.

AMPHIDOXA DC.

‡1. **gnaphaloides* DC.—Near Uit.; P.E., Z. 2890.

LASIOPOGON Cass.

1. *muscoides* DC.—Redhouse, May, Nov.

METALASIA R. Br.

1. *aurea* Don.—P.E.; between Zwartkops and Sundays Rs.
2. *pulcherrima* Less.—Uit., May, June.
†‡3. *muricata* Less.—Schoenmaakers Kop, Apr.; P.E.; Redhouse, Mar.; foot of Witteklip; Zuurberg. Var. γ.—Van Stadens, Z. 278.
†4. *fasciculata* Don—Walmer, Jan.; P.E.

ELYTROPAPPUS Cass.

†1. *Rhinocerotis* Less.—Near Uit., Schlechter 2552 (introduced ?).

AMPHIGLOSSA DC.

1. *callunoides* DC.—Springfields, Mar.; channel of Zwartkops R., Z. 45; Uit., Apr., Schlechter 2552.

Disparago Gaertn.
1. *ericoides* Gaertn.—P.E., July ; Redhouse, Feb. and Aug. ; Van Stadens Mts., Jan., Bolus 1626, Z. 712.

Stoebe L.
‡1. **tortilis* DC.—Uit.
†2. **alopecuroides* Less.—Zwartkops R.
†‡3. *cinerea* Thunb.—Walmer, Oct. ; P.E., July ; Redhouse, Mar. ; Bethelsdorp, Aug. ; foot of Witteklip.

Athrixia Ker
†1. *heterophylla* Less.—Bethelsdorp, Sept. ; Van Stadens, MacOwan 2927 ; Zuurberg.

Leyssera L.
†1. *gnaphalioides* Walp.—Redhouse, Nov. ; banks of Zwartkops R., Z. 1031, 2928.

Nestlera Spreng.
1. **humilis* Less.—Uit.

Relhania L'Her.
†1. *genistaefolia* L'Her.—Redhouse, Aug. ; banks of Zwartkops R., Z. 1114 ; near Cradockstown, P.E., Sept., Bolus 1889.
2. *quinquenervis* Thunb.—Uit.
3. *trinervis* Thunb.—P.E. ; Walmer, Jan. ; Van Stadens Mts., Jan., Bolus 1631 ; Witteklip ; Redhouse ; Uit., Z. 3840.
‡4. *pungens* L'Her.—Near P.E.
5. *speciosa* Harv.—Van Stadens, Oct.

Heterolepis Cass.
1. *mitis* DC.—In rocky places near Uit., Jan., Bolus 1650 ; Sundays R. ; Zuurberg.

Cineraria L.
1. **erodioides* DC.—Uit.
‡2. *lobata* L'Her.—P.E., Oct. ; Redhouse, Aug., Dec.
3. *saxifraga* DC.—P.E., Oct. ; Uit.

Senecio L. (incl. Kleinia L.).
1. *ficoides* Sch. Bip.—Bethelsdorp, July, T.V.P. 30 ; P.E. ; Zwartkops, Sept. ; Redhouse, Feb.
†2. *radicans* Sch. Bip.—Redhouse, Apr., Aug.
†3. *crassulaefolius* Sch. Bip.—Stony places near the Zwartkops R. ; Schoenmaakers Kop, Apr. ; Redhouse, July, T.V.P. 575 ; Baakens R., June, Bolus 2247.
4. **Ecklonis* (Harv.).—Dry hills at Addo.
5. *articulatus* Sch. Bip.—Bethelsdorp, Sept. ; Zwartkops ; Redhouse, July.
†6. *littoreus* Thunb.—Redhouse, Apr.
†7. *glutinosus* Thunb.—P.E., July, Aug. ; Humewood, M.D. 1092. Var. *inamoenus*—Zwartkops R. ; Van Stadens R., Nov., Bolus 1686 ; sandy banks between Uit. and P.E., Sept., Bolus 1686.
†8. *elegans* L.—Humewood, Oct. ; Emerald Hill, Oct. ; Walmer, Oct., T.V.P. 2342 ; P.E.
9. *multibracteatus* Harv.—Redhouse, Feb. ; Bethelsdorp.
‡10. *concolor* DC., var. *hispidus*—Van Stadens, Oct.
†‡11. *erubescens* Ait.—Bethelsdorp, Nov. ; P.E. ; Zuurberg.
†‡12. *purpureus* L.—Van Stadens Mts., ; Zuurberg.
†13. *erosus* L.—Redhouse, Sept.

SENECIO L. (incl. KLEINIA L.)—*continued.*

†‡14. *hastulatus* DC.—Redhouse, Sept. ; Humewood, Oct. ; P.E.
15. *coronatus* Harv.—Humewood, Aug.
‡16. *albanensis* DC.—Zuurberg, Mar., F.H.H. 47*a*. Var. *doroniciflorus*—Redhouse, Mar. ; Van Stadens Mts., Jan., Bolus 1506.
17. **monticolus* DC.—Uit.
18. *gramineus* Harv.—Van Stadens Mts.
‡19. *crenulatus* DC.—Dist. of Uit. (frequent) ; P.E., Aug. ; foot of Witteklip.
‡20. *othonnaeflorus* DC.—P.E., May, June ; Redhouse, Mar. ; mountains above Uit.
‡21. *oxyriaefolius* DC.—Redhouse, June ; Zwartkops.
‡22. *rhomboideus* Harv.—Redhouse, Mar., Aug.
23. *tropaeolifolius* MacOwan—Zuurberg.
24. *paucifolius* DC.—P.E., June ; Redhouse, Apr., June ; Despatch, F.H.H. 363 ; near Zwartkops R., Z. 957.
25. *latifolius* DC.—Dist. of Uit. ; Zuurberg.
26. *isatideus* DC.—Zuurberg.
27. *crenatus* Thunb.—Van Stadens Mts., Jan., Bolus 1525, MacOwan 1050 ; Zuurberg.
28. *Zeyheri* Turcz—Redhouse, Apr. ; Zuurberg, Mar.
29. **pellucidus* DC.—Uit.
†30. *lyratus* L.—Van Stadens Mts., Jan., Oct., Bolus 1526.
†‡31. *rigidus* L.—Baakens R. valley, Nov. ; Addo and Zwartkops R., Z. 486 ; Van Stadens.
32. *ilicifolius* Thunb.—P.E., Oct. ; Walmer ; Redhouse, Nov.
‡33. *juniperinus* L.—P.E., Oct., Nov. ; Redhouse, Oct. ; Zwartkops R., Z. 2945, 182 ; Zuurberg.
34. *oederiaefolius* DC.—Walmer, Oct., Nov. ; Van Stadens Mts., Jan., Bolus 1524, MacOwan 1037, Z. 709 ; Coega.
35. **hirtifolius* DC.—Near the Zwartkops R.
†‡36. *lanceus* Ait.—Zwartkops R., MacOwan 1074, Z. 579 ; near Uit., Schlechter 2578 ; Despatch, June, F.H.H. 432 ; banks of Zwartkops R., Jan., Bolus 1501 ; Van Stadens, Z. 701.
†37. *glastifolius* L.—Van Stadens Mts., Jan., Bolus 1523, MacOwan 1036.
38. *oliganthus* DC.—Van Stadens, MacOwan 1038 ; Zuurberg, Apr.
†39. *umbellatus* L., var. *latiusculus*—Redhouse ; Humewood ; Van Stadens Mts. ; Bethelsdorp ; Walmer, Oct. ; Walmer Flats, Sept., Oct., Bolus 1886.
40. *serrurioides* Turcz—On the flats near Van Stadens Mts., Z. 274 ; Van Stadens Mts., Jan., Bolus 1513.
†‡41. *paniculatus* Berg, var. *reclinatus*—Zwartkops R., Z. 623, 583 ; P.E., Nov. ; Van Stadens Mts., Jan., Bolus 1527.
42. *leptophyllus* DC.—Redhouse, July.
43. *inaequidens* DC.—Walmer, Aug. ; Zwartkops R. ; Redhouse, Oct.
44. **debilis* Harv.—Uit.
‡45. *longifolius* Linn.—P.E. ; Redhouse, Apr., July ; Redhouse.
†46. *rosmarinifolius* L.—Between Kraggakamma and Van Stadens, E. and Z. ; near banks of Zwartkops R., Z. 432 ; Schoenmaakers Kop, Apr.

SENECIO L. (incl. KLEINIA L.)—*continued.*

†‡47. *Burchelli* DC.—Redhouse, Dec.; Aloes, Sept.
48. **dracunculoides* DC.—Zwartkops R.
49. **hirtellus* DC.—Uit.
†50. *pinifolius* Lam.—Van Stadens, Z. 814.
‡51. *mikanioides* Ott.—Redhouse, Apr.
‡52. *deltoideus* Less.—P.E., Aug.; Uit.
‡53. *quinquelobus* DC.—Van Stadens, May.
‡54. *macroglossus* DC.—Redhouse, Sept.
‡55. *angulatus* L. f.—P.E., June; Van Stadens, Apr.
56. *crassiusculus* DC.—Zwartkops R.; Zuurberg, Apr.
57. *pyramidatus* DC.—Zwartkops, Sept.
58. *scaposus* DC.—P.E., Dec.; Redhouse, Feb.; sandy hills near Uit, Jan, Dec., Bolus 1522.
59. *junceus* Haw.—Redhouse, Apr., June; Cradockplace, near P.E., E. E. Galpin 6398; near Uit., Schlechter 2556.
60. ? *n. sp.*—Van Stadens, MacOwan 1064.

EURYOPS Cass.

1. *algoensis* DC.—Schoenmaakers Kop, Apr.; Cradockplace, near P.E., Galpin 6358; P.E., Apr.; Uit.
‡2. *tenuissimus* Less.—Zwartkops R., Z. 65; Redhouse, Apr.
3. *spathaceus* DC.—Uit.; New Brighton, Aug.

GAMOLEPSIS Less.

1. *chrysanthemoides* DC.—Uit.
2. *trifurcata* Less.—Uit., Schlechter 2534.
3. *euryopoides* DC.—Bethelsdorp, Sept.; Van Stadens; Uit., E. and Z.; P.E.
4. *munita* Less.—Bethelsdorp, Nov.; between Kraggakamma and Van Stadens; Elandsberg, MacOwan 1052; Van Stadens Mts., Jan., Bolus 1619.
5. *ericoides* Less.—Coega, Oct.; Uit.; Redhouse, Aug.; Cradocktown, near P.E., Sept., Bolus 1887.
6. *brachypoda* DC.—Uit., Jan.
7. *sp.* (close to *G. munita* Less.)—Van Stadens, May, T.V.P. 2440.

OTHONNOPSIS Jaub. et Spach

1. *Kraussii* Benth. et Hook. (= *Doris Kraussii* Sch. Bip.)—Near the mouth of the Zwartkops R., Redhouse, Sept.; Uit.
2. **alata* Benth. et Hook. (= *Doria alata* Thunb.)—Uit.

OTHONNA L.

†1. *parviflora* L.—Van Stadens, May, MacOwan 1066; on the top of the Van Stadens Mts., Z. 796 (var. *bupleuroides*), Bolus 1616.
2. *quinquedentata* Thunb.—Witteklip.
3. *membranifolia* DC.—Springfields, Nov.; Van Stadens, May, June, Nov., Bolus 2361.
†4. *amplexicaulis* Thunb.—Van Stadens, Oct., MacOwan 1100 Schoenmaakerskop.
‡5. *carnosa* Less.—Redhouse, Apr.; hillsides near P.E., Nov.
6. **crassifolia* Harv.—Uit.; Bethelsdorp.
7. *obtusiloba* Harv.—P.E., Feb.

OTHONNA L.—*continued.*

8. *rufibarbis* Harv.—Walmer, Apr.; Baakens R. valley, May; P.E., June, Bolus 2229.
9. **pinnatilobata* Sch. Bip. (= *Doria carnosa* DC.)—Grassy hills in Uit. dist.; Addo.
10. **eriocarpa* Sch. Bip. (= *Doria eriocarpa* DC.)—Zwartkops R.
11. *Gymnodiscus* Sch. Bip. (= *Doria Gymnodiscus* DC.)—P.E.; Redhouse.

OLIGOCARPUS Less.

‡1. *calendulaceus* Less.—Uit.; P.E.

TRIPTERIS Less.

1. **spathulata* DC.—Zwartkops R.

DIMORPHOTECA Vaill.

†‡1. *fruticosa* DC.—P.E. Sept.; Uit.; Redhouse, Apr.
2. *Ecklonis* DC.—Van Stadens, Sept., Nov.; Zwartkops R.; P.E.
‡3. *cuneata* DC.—Redhouse, July to Sept., T.V.P. 21; Uit.; Coega.

OSTEOSPERMUM L.

‡1. **herbaceum* L.—Uit.
†‡2. *moniliferum* L.—Redhouse, Apr.; Despatch, June; near the Zwartkops R., Z. 110, 74; Humewood, Apr.; Bethelsdorp, Nov.; P.E., Feb.; Van Stadens, Nov., Bolus 1621; Schoenmaakerskop.
3. *coriaceum* DC.—Van Stadens, Nov.; Van Stadens Mts., Jan., Bolus 1621.
‡4. *grandidentatum* DC.—Schoenmaakers Kop, Apr.; P.E., Oct.
5. *scabrum* Thunb.—Redhouse, Aug., Dec.; Zwartkops R., Z. 69.
6. *corymbosum* L.—Van Stadens, Nov. to Jan., Bolus 1622; flats near Van Stadens, Z. 307; Schoenmaakers Kop, Mar.; Emerald Hill, Jan., Bolus 9801; Walmer, Aug.; Redhouse, Apr.
†7. *imbricatum* L.—P.E., June, H. Bolus 2241.
‡8. *nervatum* DC.—P.E., June, H. Bolus 753.

URSINIA Gaertn. (incl. SPHENOGYNE R. Br.)

1. *anthemoides* Gaertn.—Zwartkops R. Var. *microcephala* Harv.—Redhouse, July.
2. *foeniculacea* Poir.—Redhouse, Sept.; Sand-hills near Zwartkops R., Z. 1011.
3. *anethoides* (DC.)—Van Stadens, Jan., Aug., Nov.; Van Stadens Mts., Bolus 1632; Uit. Mts.
4. **discolor* (Less.)—Uit.
5. *heterodonta* (DC.)—Van Stadens R., MacOwan 2330; Kamaehs.
6. *scariosa* Poir.—Van Stadens, Oct.
†7. *filicaulis* DC. = *U. chrysanthemoides* Harv.—Redhouse, Oct.; ? P.E., July; Kraggakamma, Dec.
8. *annua* Less.—Redhouse, July; P.E., July.

HAPLOCARPHA Less.

1. *lyrata* Harv.—Redhouse, Aug.; Zuurberg.
2. *scaposa* Harv.—Zuurberg.

CRYPTOSTEMMA R. Br. (incl. MICROSTEPHIUM Less.)
- †‡1. *calendulaceum* R. Br.—P.E., June; Redhouse, Nov.
- †‡2. *niveum* Nichols (= *Microstephium niveum* Less.)—Redhouse, July; along the seashore near P.E., MacOwan 1094; mouth of the Zwartkops R., Z. 421.

ARCTOTIS L.
- †1. **acaulis* L.—Uit.
- †2. *stoechadifolia* Berg—Redhouse, Aug.; Humewood, T.V.P. 1029 (with very narrow almost entire leaves). Var. *discolor*—Zwartkops R., Z. 2996; P.E., Aug., Nov., Bolus 10378, July, Miss West 217. Var. *grandis* Less.—Kraggakamma, Dec., MacOwan 1096.

  NOTE.—There appear to be several distinct species mixed up under *A. stoechadifolia.*

VENIDIUM Less.
- 1. *decurrens* Less.—P.E., Feb.; Van Stadens Mts.
- 2. **hispidulum* Less.—Zwartkops R.
- ‡3. *arctotoides* Less.—Uit., Schlechter 2586.
- 4. *discolor* Less.—Witteklip, Jan., Bolus.
- 5. *perfoliatum* Less.—Van Stadens, Apr.

GAZANIA Gaertn.
- ‡1. *uniflora* Sims—Redhouse, Apr.; Schoenmaakers Kop, Apr.; P.E.; on downs along the strand of Algoa Bay, Z. 615.
- ‡2. **subulata* R. Br.—Between Van Stadens and Bethelsdorp.
- ‡3. *longiscapa* DC.—Bethelsdorp, Nov.; Redhouse, Aug.; P.E.; Van Stdens, Schlechter 6073 Schoenmaakerskop.
- †4. *pinnata* Less., var.—P.E., June; Zwartkops R.

CULLUMIA R. Br.
- 1. *cirsioides* DC.—Witteklip, Jan.; Van Stadens Mts., Jan., Bolus 1507.
- 2. *decurrens* Less.—Reed's Bog, near P.E., Sept., Bolus 1894.

CYPSELODONTIA DC.
- 1. **Eckloniana* DC.—Dist. of Uit.

BERKHEYA Ehrh. (incl. STOBAEA Thunb.)
- 1. **glabriuscula* (DC.)—Uit.
- 2. **polyacantha* (DC.)—Uit.
- 3. *scolymoides* DC.—Bethelsdorp, Jan.; P.E., Aug.
- 4. *petiolata* (DC.)—Zwartkops R.; Van Stadens R.; Van Stadens Mts., Jan., H. Bolus 1618.
- ‡5. *echinopoda* DC.—Near the Zwartkops and Van Stadens Rs.; valley near P.E., June, H. Bolus 2230.
- 6. **membranifolia* (DC.)—Uit.
- 7. *heterophylla* (Thunb.)—Redhouse, Oct.; P.E., Mar.; hills by the Zwartkops R., Z. 517.
- 8. *lanceolata* Willd.—P.E., Aug., J.L.D. 59, Oct., W.K. 106.

STEPHANOCOMA Less.
- 1. *carduoides* Less.—Zuurberg, Mar.

DIDELTA L'Her.
- 1. *cernuum* Less.—Despatch, June, Oct. Uit.; Coega, Nov.
- 2. *annuum* Less.—Redhouse, Aug., Dec.

  These two species cannot be satisfactorily separated from one another. Broadly speaking, *cernuum* is the eastern form of *annuum*.—(L. B.).

DICOMA Less.
1. *radiata Less.—Uit.
2. *diacanthoides Less.—Uit.

CARDUUS L.
1. §sp.—P.E., Oct., T.V.P. 2596.

CENTAUREA L.
†1. §*calcitrapa* L.—Cultivated ground at Cuylerville.

OLDENBURGIA Less.
1. *arbuscula* DC.—Zuurberg, Mar.,

HYPOCHAERIS Vaill.
†‡1. *glabra* L.—Van Stadens, Sept.; Zwartkops R.
2. *sp.*—Redhouse, July, T.V.P. 3150.

GERBERA Gron.
1. *tomentosa* DC.—Bethelsdorp, Nov.; Van Stadens, Jan., H. Bolus 1625, MacOwan 1061.
2. *cordata* Less.—P.E., June; Uit.; Van Stadens.
†‡3. *piloselloides* Cass.—Van Stadens, Sept.; Uit.; Zuurberg.
‡4. *ambigua* Sch.—P.E.; Uit.; Van Stadens R., Nov., H. Bolus 1191.

HIERACIUM L.
†‡1. **capense* L.—Zwartkops R.

LACTUCA Tourn.
†‡1. *capensis* Thunb.—P.E., Feb., May; Van Stadens, Sept.; Redhouse, Oct.

SONCHUS L.
†1. **dregeanus* DC.—Zwartkops R.
†‡2. §*oleraceus* L.—Redhouse, Mar., Apr.

LAUNEA Cass. (MICRORHYNCHUS Less.)
1. *dregeanus* DC.—Hougham Park, Coega, May.

UITENHAGE AND PORT ELIZABETH PHANEROGAMIC FLORA.

RECAPITULATION.

Genera with western distribution, not going beyond our area in the coast districts, are marked †.

Genera with eastern distribution, not going beyond our area in the coast districts, are marked ‡.

Genera restricted to our area are marked ||.

Introduced genera are marked §.

The numbers in brackets denote the numbers of species recorded.

	Total Species.	Non-Native Species.
GYMNOSPERMAE (7).		
Cycadaceae (4).		
Encephalartos.....	4	—
Pinaceae (1).		
Widdringtonia.....	1	—
Taxaceae (2).		
Podocarpus	2	—
ANGIOSPERMAE.		
Monocotyledoneae (637).		
Typhaceae (2).		
Typha............	2	—
Potamogetonaceae (6).		
Potamogeton......	5	—
Zostera...........	1	—
Aponogetonaceae (3).		
Aponogeton.......	3	—
Scheuchzeriaceae (3). .		
Triglochin.........	3	—
Hydrocharitaceae (1).		
‡Lagarosiphon......	1	—
Graminaceae (127).		
Erianthus.........	2	—
Pollinia...........	1	—
Rottboellia........	1	—
Trachypogon......	1	—
‡Elionurus.........	1	—
Andropogon.......	7	—
Anthistiria........	2	—
Paspalum.........	1	—
Digitaria..........	4	—
Panicum..........	7	—
‡Oplismenus.......	1	—
Setaria...........	5	—
Pennisetum.......	2	—
Stenotaphrum.....	1	—
Tricholaena.......	1	—
Arundinella.......	1	—
Tristachya........	1	—
Achneria..........	1	—
§Aira..............	1	1
Graminaceae (contd.)		
§Koeleria..........	1	1
Avenastrum.......	2	—
Pentaschistis......	5	—
Danthonia........	5	—
§Arundo.....	1	1
Phragmites.......	1	—
§Lagurus..........	1	1
Polypogon........	2	—
Agrostis..........	1	—
Aristida..........	6	—
Stipa.............	1	—
Tragus...........	2	—
Sporobolus........	4	—
Diplachne.........	1	—
Eragrostis.........	8	—
(? §) Spartina..........	1	—
Cynodon..........	2	—
Microchloa........	1	—
Harpechloa.......	1	—
Chloris...........	2	—
§Eleusine..........	1	1
Triraphis.........	1	—
Leersia...........	1	—
Ehrharta.........	6	—
Phalaris..........	2	1
Melica............	1	—
Fingerhuthia......	1	—
Schismus.........	2	—
Lasiochloa........	2	—
†Brizopyrum.......	1	—
§Briza............	2	2
§Poa..............	1	1
†Atropis...........	1	—
†§Scleropoa.........	1	1
Festuca..........	1	—
§Vulpia............	2	2
§Bromus...........	4	4
§Lolium...........	4	4
Lepturus..........	1	
Agropyrum.......	1	—
§Hordeum.........	1	1

	Total Species.	Non-Native Species.
Cyperaceae (86).		
Kyllinga	2	—
Pycreus	6	—
Juncellus	1	—
Cyperus	13	—
Mariscus	8	—
Eleocharis	1	—
Fimbristylis	1	—
Bulbostylis	2	—
Scirpus	14	—
Ficinia	22	—
Fuirena	2	—
Carpha	1	—
Tetraria	2	—
†Macrochaetium	1	—
‡Cladium	1	—
Schoenoxiphium	2	—
Carex	4	—
Not identified	3	—
Aroidaceae (1).		
Zantedeschia	1	—
Lemnaceae (3).		
Lemna	2	—
Wolffia	1	—
Restiaceae (24).		
Restio	5	—
†Dovea	3	—
Elegia	3	—
†Lamprocaulos	1	—
Leptocarpus	2	—
†Thamnochortus	3	—
†Hypolaena	1	—
†Hypodiscus	3	—
†Cannamois	1	—
Incertae sedis	2	—
Xyridaceae (1).		
Xyris	1	—
Commelinaceae (4).		
Commelina	3	—
Cyanotis	1	—
Juncaceae (13).		
Juncus	12	—
Prionium	1	—
Haemodoraceae (7).		
†Wachendorfia	2	—
Lanaria	1	—
‡Sansevieria	2	—
Cyanella	2	—
Amaryllidaceae (47).		
Forbesia	1	—
Ianthe	3	—
Hypoxis	11	—
Hessea	2	—

	Total Species.	Non-Native Species.
Amaryllidaceae (con.)		
†Gethyllis	1	—
Apodolirion	1	—
Crinum	3	—
Ammocharis	1	—
Brunsvigia	2	—
Nerine	3	—
†Strumaria	1	—
Cyrtanthus	10	—
Haemanthus	7	—
Buphane	1	—
Liliaceae (161).		
Asparagus	12	—
‡Behnia	1	—
‡Dracaena	1	—
Kniphofia	2	—
Gasteria	6	—
Aloe	16	—
Haworthia	9	—
Bulbine	9	—
‡Schizobasis	2	—
Eriospermum	4	—
Anthericum	12	—
Chlorophytum	3	—
†Caesia	1	—
‡Agapanthus	1	—
Tulbaghia	3	—
Allium	2	1
Massonia	3	—
Polyxena	1	—
‖Neopatersonia	1	—
Lachenalia	3	—
Drimia	6	—
‡Litanthus	1	—
Dipcadi	3	—
Albuca	19	—
Urginea	6	—
Veltheimia	1	—
‡Eucomis	1	—
‡Scilla	9	—
Ornithogalum	14	—
†Androcymbium	5	—
Wurmbea	1	—
†Dipidax	1	—
†Ornithoglossum	1	—
Neodregea	1	—
Dioscoreaceae (3).		
Dioscorea	1	—
Testudinaria	2	—
Iridaceae (72).		
Moraea	10	—
Homeria	1	—
†Ferraria ?	1 ?	—
†Hexaglottis	1	—
Syringodea	1	—
Romulea	5	—
Bobartia	2	—
Aristea	6	—

	Total Species.	Non-Native Species.
Iridaceae (con.)		
Hesperantha	3	—
Geissorhiza	7	—
Ixia	1	—
Dierama	2	—
†Micranthus	1	—
Freesia	1	—
Watsonia	2	—
†Babiana	1	—
†Melasphaerula	1	—
†‖Sparaxis	1	—
Tritonia	6	—
Acidanthera	1	—
Gladiolus	12	—
Antholyza	6	—
Musaceae (2).		
Strelitzia	2	—
Cannaceae (1).		
§Canna	1	1
Orchidaceae (70).		
Acrolophia	3	—
Eulophia	7	—
Lissochilus	4	—
Polystachya	1	—
Angraecum	3	—
Listrostachys	1	—
Mystacidium	1	—
Bartholina	2	—
Holothrix	9	—
Habenaria	5	—
Bonatea	2	—
Satyrium	10	—
Monadenia	2	—
Herschelia	1	—
Penthea	1	—
Disa	9	—
†Schizodium	1	—
‡Brownleea	1	—
†Ceratandropsis	1	—
Ceratandra	1	—
Pterygodium	3	—
Corycium	1	—
Disperis	1	—
Dicotyledoneae.		
ARCHICHLAMYDEAE (894).		
Piperaceae (1).		
Peperomia	1	—
Salicaceae (1).		
Salix	1	—
Myricaceae (5).		
Myrica	5	—

	Total Species.	Non-Native Species.
Urticaceae (7).		
Urtica	3	1
Fleurya	2	—
Australina	2	—
Ulmaceae (2).		
Celtis	1	—
Chaetacme	1	—
Moraceae (2).		
Ficus	2	—
Proteaceae (16).		
Leucadendron	5	—
Protea	9	—
Leucospermum	1	—
†Nivenia	1	—
Loranthaceae (6).		
‡Loranthus	1	—
Viscum	5	—
Santalaceae (29).		
Thesium	26	—
Osyris	1	—
Rhoiocarpus	1	—
Thesidium	1	—
Grubbiaceae (1).		
†Grubbia	1	—
Rafflesiaceae (1).		
†Cytinus	1	—
Polygonaceae (14).		
Polygonum	7	3
Rumex	6	3 ?
Emex	1	—
Chenopodiaceae (12).		
§Chenopodium	4	4
Exomis	1	—
§Atriplex	2	2
Chenolea	1	—
Salicornia	2	—
Suaeda	2	—
Amarantaceae (10).		
Amarantus	3	2
‡Cyathula	1	—
‡Pupalia	2	—
Achyranthes	1	1
‡Achyropsis	1	—
‡Alternanthera	1	1
‡Gomphrena	1	1
Phytolaccaceae (5).		
Phytolacca	1	—
Limeum	1	—
Psammotropha	1	—
†Adenogramma	2	—

	Total Species.	Non-Native Species.
Aizoaceae (79).		
Orygia	1	—
Hypertelis	1	—
Pharnaceum	3	—
Mesembrianthemum	64	—
Tetragonia	4	—
Aizoon	2	—
Galenia	4	—
Portulacaceae (5).		
Anacampseros	3	—
§Portulaca	1	1
Portulacaria	1	—
Basellaceae (1).		
§Boussingaultia	1	1
Caryophyllaceae (21).		
Dianthus	5	1
Silene	7	1
§Stellaria	1	1
Cerastium	1	—
§Spergula	1	1
§Spergularia	2	2
§Polycarpon	1	1
Pollichia	1	—
§Herniaria	1	1
§Corrigiola	1	1
Nymphaeaceae (1).		
Nymphaea	1	—
Ranunculaceae (5).		
Clematis	1	—
Knowltonia	3	—
Ranunculus	1	—
Menispermaceae (2).		
Cissampelos	1	—
Antizoma	1	—
Lauraceae (2).		
Cassytha	1	—
Ocotea	1	—
Papaveraceae (5).		
§Papaver	1	1
§Argemone	1	1
Corydalis	2	1
§Fumaria	1	1
Cruciferae (25).		
§Brassica	2	1
§Diplotaxis	1	1
§Sinapis	1	1
Heliophila	13	—
Nasturtium	2	1
Sisymbrium	2	1
Lepidium	3	—
§Capsella	1	—
Capparidaceae (6).		
Capparis	4	—
Cadaba	1	—
Maerua	1	—
Droseraceae (2).		
Drosera	2	—
Crassulaceae (64).		
Dinacria	1	—
Crassula	50	—
Rochea	1	—
Cotyledon	10	—
Kalanchoe	2	—
Saxifragaceae (1).		
Montinia	1	—
Pittosporaceae (1).		
Pittosporum	1	—
Cunoniaceae (2).		
Cunonia	1	—
†Platylophus	1	—
Bruniaceae (6).		
Berzelia	3	—
†Brunia	1	—
†Pseudobaeckia	2	—
Hamamelidaceae (2).		
Trichocladus	2	—
Rosaceae (11).		
Rubus	2	—
Alchemilla	1	—
Cliffortia	8	—
Leguminosae (149).		
†Cyclopia	2	—
Podalyria	3	—
†Priestleya	1	—
Amphithalea	2	—
†Borbonia	1	—
Rafnia	1	—
Lotononis	14	—
Lebeckia	4	—
Aspalathus	20	—
‡Buchenroedera	1	—
Melolobium	2	—
Crotalaria	3	—
Medicago	2	—
Melilotus	1	—
Argyrolobium	10	—
Trifolium	2	—
Psoralea	14	—
Indigofera	22	—
Tephrosia	4	—
Sutherlandia	1	—
Lessertia	8	—
Hallia	3	

	Total Species.	Non-Native Species.
Leguminosae (con.)		
Vicia	1	—
‡Erythrina	1	—
Vigna	3	—
Dolichos	4	—
Rhynchosia	8	—
‡Eriosema	1	—
†Virgilia	1	—
‡Calpurnia	1	—
‡Cassia	3	2
‡Schotia	3	—
Acacia	2	—
Geraniaceae (40).		
§Erodium	1	1
Geranium	3	—
Pelargonium	35	—
Monsonia	1	—
Oxalidaceae (18).		
Oxalis	18	—
Linaceae (3).		
Linum	3	—
Zygophyllaceae (7).		
Zygophyllum	6	—
Tribulus	1	—
Rutaceae (33).		
Diosma	1	—
†Coleonema	1	—
Acmadenia	1	—
Barosma	7	—
Agathosma	16	—
†Macrostylis	2	—
†Empleurum	1	—
Fagaria	1	—
Toddalia	1	—
‡Clausena	1	—
Calodendron	1	—
Meliaceae (3).		
Ekebergia	1	—
‡Ptaeroxylon	1	—
Nymania	1	—
Polygalaceae (17).		
Muraltia	6	—
Mundia	1	—
Polygala	10	—
Euphorbiaceae (53).		
Euphorbia	22	—
†Lachnostylis	1	—
Andrachne	1	—
‡Croton	1	—
‡Jatropha	1	—
‡Phyllanthus	3	—
Cluytia	11	—
Leidesia	1	—
Euphorbiaceae (con.)		
(‖?) Seidelia	1	—
Acalypha	5	—
§Ricinus	1	1
Adenocline	2	—
Dalechampia	1	—
‡Gelonium	1	—
‡Ctenomeria	1	—
Callitrichaceae (1).		
‡Callitriche	1	—
Anacardiaceae (24).		
Harpephyllum	1	—
‡Loxostylis	1	—
†Laurophyllus	1	—
Rhus	21	—
Aquifoliaceae (1).		
Ilex	1	—
Celastraceae (26).		
Putterlickia	1	—
Pterocelastrus	2	—
Gymnosporia	13	—
Cassine	2	—
Elaeodendron	2	—
Mystroxylon	4	—
‡Pleurostylia	1	—
Lauridia	1	—
Icacinaceae (1).		
Apodytes	1	—
Sapindaceae (5).		
Allophylus	1	—
†Smelophyllum	1	—
Pappea	1	—
‡Hippobromus	1	—
†Dodonaea	1	—
Melianthaceae (1).		
Melianthus	1	—
Balsaminaceae (1).		
Impatiens	1	—
Rhamnaceae (14).		
Rhamnus	1	—
Scutia	2	—
Noltea	1	—
‡Helinus	1	—
Phylica	9	—
Ampelidaceae (6).		
Rhoicissus	4	—
‡Cissus	2	—
Tiliaceae (3).		
Grewia	2	—
†Sparmannia	1	—

	Total Species.	Non-Native Species.
Malvaceae (13).		
§Malva	1	1
Malvastrum	2	—
‡Sida	2	—
‡Abutilon	1	—
‡Pavonia	1	—
Hibiscus	6	—
Sterculiaceae (25).		
‡Sterculia	1	—
Hermannia	22	—
‡Melhania	1	—
‡Dombeya	1	—
Guttiferae (2).		
Hypericum	2	—
Ochnaceae (2).		
Ochna	2	—
Elatinaceae (1).		
Bergia	1	—
Frankeniaccae (2).		
†Frankenia	2	—
Violaceae (1).		
Hybanthus	1	—
Flacourtiaceae (7).		
Kiggelaria	1	—
Scolopia	3	—
Doryalis	2	—
Trimeria	1	—
Achariaceac (2).		
‡Ceratosicyos	1	—
‡Acharia	1	—
§*Cactaceae* (3 ?).		
§Opuntia	3 ?	3?
Penaeceae (5).		
†Penaea	5	—
Thymelaeaceae (24).		
Passerina	4	—
Lachnaea	1	—
Struthiola	6	—
Gnidia	9	—
Lasiosiphon	4	—
Oliniaceae (1).		
Olinia	1	—
§*Lythraceae* (1).		
§Lythrum	1	1
Combretaceae (1).		
‡Combretum	1	—
Myrtaceae (2).		
‡Eugenia	2	—
§*Oenotheraceae* (5).		
§Oenothera	3	3
§Epilobium	2	2
Halorrhagidaceae (2).		
Laurembergia	1	—
Myriophyllum	1	—
Araliaceae (2).		
‡Cussonia	2	—
Umbelliferae (37).		
Hydrocotyle	6	—
Alepidea	1	—
Apium	2	—
†Trachyspermum	1	—
‡Carum	2	—
Pimpinella	1	—
Sium	1	—
Rhyticarpus	1	—
Bupleurum	2	—
Heteromorpha	1	—
Lichtensteinia	2	—
Anesorrhiza	2	—
Foeniculum	1	—
Pituranthos	1	—
Seseli	1	—
Cnidium	1	—
Peucedanum	6	—
†Capnophyllum	1	—
Caucalis	1	—
Arctopus	1	—
†Hermas	1	—
Conium	1	—
Cornaceae (1).		
Curtisia	1	—
METACHLAMYDEAE (794).		
Ericaceae (40).		
Erica	31	—
†Blaeria	2	—
Coilostigma	2	—
†Thoracospermum	1	—
‖Thamnus	1	—
†Simocheilus	2	—
†Anomalanthus	1	—
Myrsinaceae (3).		
Myrsine	3	—
Primulaceae (4).		
‡Lysimachia	1	—
§Anagallis	1	1
Samolus	2	—

	Total Species.	Non-Native Species.
Plumbaginaceae (3).		
Statice	2	—
‡Plumbago	1	—
Sapotaceae (1).		
Sideroxylon	1	—
Ebenaceae (10).		
Royona	3	—
Euclea	7	—
Oleaceae (8).		
Jasminum	2	—
Olea	6	—
Salvadoraceae (1).		
Azima	1	—
Loganiaceae (6).		
‡Gomphostigma	1	—
Nuxia	1	—
Chilianthus	2	—
Buddleia	1	—
‡Strychnos	1	—
Gentianaceae (16).		
Sebaea	8	—
Chironia	6	—
†Villarsia	1	—
Limnanthemum	1	—
Apocynaceae (5).		
Carissa	1	—
Acokanthera	1	—
Gonioma	1	—
‡Pachypodium	2	—
Asclepiadaceae (65).		
‡Raphionacme	1	—
Secamone	2	—
Astephanus	1	—
†Microloma	1	—
‡Woodia	1	—
Xysmalobium	2	—
Schizoglossum	6	—
Asclepias	8	—
Pachycarpus	2	—
†Glossostephanus	1	—
‡Pentarrhinum	1	—
Cynanchum	5	—
Sarcostemma	1	—
‡Tylophora	4	—
‡Marsdenia	1	—
Fockea	1	—
‡Tenaris	1	—
‡Ceropegia	5	—
Brachystelma	5	—
‡Anisotoma	1	—
Huernia	3	—
Stapelia	7	—
Duvalia	5	—

	Total Species.	Non-Native Species.
Convolvulaceae (14).		
Ipomaea	4	—
Convolvulus	5	—
Dichondra	1	—
Falkia	2	—
Cuscuta	2	1
Boraginaceae (19).		
‡Cordia	1	—
Ehretia	1	—
Heliotropium	3	—
Cynoglossum	2	—
Echinospermum	1	—
Anchusa	1	—
Myosotis	1	—
Lithospermum	2	—
Lobostemon	5	—
Echium	2	2
Verbenaceae (6).		
†Stilbe	2	—
Lantana	1	—
Bouchea	1	—
‡Priva	1	—
§Verbena	1	1
Labiatae (42).		
‡Becium	1	—
Plectranthus	5	—
Mentha	2	2?
Salvia	11	—
Stachys	9	—
§Marrubium	1	1
Ballota	1	—
‡Leucas	1	—
‡Lasiocorys	1	—
Leonotis	7	—
Teucrium	2	—
Ajuga	1	—
Solanaceae (23).		
Solanum	10	3 ?
§Physalis	1	1
Withania	1	1
Lycium	8	—
§Datura	1	1
§Nicotiana	1	1
§Cestrum	1	1
Selaginaceae (26).		
Hebenstreitia	2	—
†Dischisma	2	—
Walafrida	12	—
Selago	10	—
Scrophulariaceae (62).		
Aptosimum	1	—
Peliostomum	1	—
‖Alonsoa	1	—
Diascia	2	—
Hemimeris	1	—

	Total Species.	Non-Native Species.
Scrophulariaceae (con.)		
Nemesia	4	—
Diclis	1	—
Halleria	2	—
†Freylinia	2	—
Manulea	3	—
Sutera	16	—
Phyllopodium	4	—
Polycarena	1	—
Zaluzianskya	5	—
Limosella	2	—
Ilysanthes	1	—
§Veronica	1	—
Melasma	3	—
‡Striga	2	—
Sopubia	1	—
Bopusia	1	—
Buchnera	1	—
‡Cycnium	1	—
Ramphicarpa	1	—
Harveya	3	—
Hyobanche	1	—
Bignoniaceae (2).		
‡Tecomaria	1	—
Rhigozum	1	—
Gesneriaceae (1).		
Streptocarpus	1	—
Lentibulariaceae (4).		
Utricularia	4	—
Acanthaceae (33).		
Thunbergia	2	—
Ruellia	1	—
Chaetacanthus	2	—
Blepharis	5	—
‡Crabbea	2	—
Barleria	4	—
Justicia	5	—
Monechma	3	—
‡Isoglossa	3	—
‡Peristrophe	3	—
Hypoestes	2	—
Dicliptera	1	—
Plantaginaceae (5).		
Plantago	5	1
Valerianaceae (1).		
Valeriana	1	—
Dipsaceae (2).		
Cephalaria	1	—
Scabiosa	1	—
Rubiaceae (27).		
Burchellia	1	—
Gardenia	3	—
‡Randia	1	—
Rubiaceae (con.)		
Oldenlandia	5	—
‡Vangueria	1	—
Plectronia	3	—
‡Pavetta	2	—
‡Psychotria	1	—
Hydrophylax	1	—
Galopina	1	—
Anthospermum	4	—
†Carpacoce	1	—
†Rubia	1	—
Galium	2	—
Cucurbitaceae (14).		
Melothria	3	—
Coccinia	1	—
Cucumis	3	—
Kedrostis	7	—
Campanulaceae (31).		
Lobelia	7	—
Monopsis	1	—
Metzleria	1	—
Lightfootia	7	—
Wahlenbergia	6	—
Prismatocarpus	2	—
Roella	3	—
Cyphia	4	—
Goodeniaceae (1).		
Scaevola	1	—
Compositae (299).		
Vernonia	3	—
‡Platycarpha	1	—
Corymbium	4	—
‡Mikania	1	—
Amellus	1	—
Microglossa	1	—
‖Anaglypha DC.	1	—
Aster	14	—
Felicia	1	—
§Erigeron	2	2
Nidorella	4	—
Chrysocoma	1	—
Pteronia	6	—
Conyza	4	—
Brachylaena	4	—
Tarchonanthus	2	—
Pulicaria	1	—
Iphiona	1	—
§Bidens	1	—
†Iocaste	1	—
Printzia	1	—
Matricaria	1	—
Pentzia	3	—
‖Adenosolen	1	—
Cotula	7	—
Eriocephalus	1	—
Athanasia	5	—
§Xanthium	1	1

	Total Species.	Non-Native Species.
Compositae (con.)		
Leontonyx	3	—
Helichrysum	41	—
Ifloga	1	—
Helipterum	2	—
Gnaphalium	5	—
‡Amphidoxa	1	—
Lasiopogon	1	—
Metalasia	4	—
Elytropappus	1	—
Amphiglossa	1	—
Disparago	1	—
Stoebe	3	—
Athrixia	1	—
Leyssera	1	—
Nestlera	1	—
Relhania	5	—
†Heterolepis	1	—
Cineraria	3	—
Senecio	60	—
Euryops	3	—
Gamolepis	7	—
Othonnopsis	2	—
Othonna	11	—
Oligocarpus	1	—
Compositae (con.)		
Tripteris	1	—
Dimorphotheca	3	—
Osteospermum	8	—
Ursinia	8	—
Haplocarpha	1	—
Cryptostemma	2	—
Arctotis	2	—
Venidium	5	—
Gazania	4	—
†Cullumia	2	—
‖Cypselodontia	1	—
Berkheya	8	—
Stephanocoma	1	—
†Didelta	2	—
Dicoma	2	—
§Carduus	1	1
§Centaurea	1	1
Oldenburgia	1	—
§Hypochaeris	2	2
Gerbera	4	—
Hieracium	1	—
Lactuca	1	—
Sonchus	2	1
‡Launea	1	—

UNION OF SOUTH AFRICA

Botanical Survey of South Africa

MEMOIR No. 2

BOTANICAL SURVEY

OF

NATAL AND ZULULAND

(With a Sketch Map)

By R. D. AITKEN, B.Sc., and G. W. GALE B.Sc.

PRETORIA
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DIVISION OF BOTANY,
PRETORIA, 1st *March*, 1921.

SIR,

I have the honour to transmit herewith for publication the manuscript of a paper by Messrs. Aitken and Gale, entitled "A Reconnaissance Trip through North-Eastern Zululand," and I have to recommend that the paper be printed as No. 2 of "The Memoirs of the Botanical Survey of South Africa."

The work has been carried out by Messrs. Aitken and Gale under the supervision of Professor J. W. Bews, M.A., D.Sc., of the Natal University College, Pietermaritzburg, and its important and interesting characters are mentioned by Professor Bews in his covering letter.

It is clear from Messrs. Aitken and Gale's paper that further work in this region will repay investigation, and Professor Bews is making arrangements accordingly.

I have the honour to be,
Sir,
Your obedient Servant,

I. B. POLE EVANS,
Director, Botanical Survey of South Africa.

To
The Secretary for Agriculture, Pretoria.

EASTERN AREA.

NATAL UNIVERSITY COLLEGE,
PIETERMARITZBURG, NATAL,
12*th November*, 1920.

To the Director of the Botanical Survey of the
Union of South Africa, Pretoria.

DEAR DR. POLE EVANS,

I have the honour to transmit to you an account of a recent botanical survey trip made by my assistant, Mr. R. D. Aitken, and one of my senior students, Mr. G. W. Gale, through north-eastern Zululand. The country through which they passed has remained up till now totally unexplored botanically. In spite of the fact that Aitken and Gale's visit was made during the dry season, the report they have made appears to me to be full of interest. It is a great transitional area where sub-tropical conditions give way to tropical, and this report enables us to obtain a very good general idea of the main types of vegetation and their distribution. The discovery of Raphia palm in the Kosi Bush, and the information regarding the great abundance of *Hyphaene crinita* in the Ilala Palm Veld or Sand Veld, each affords an excellent illustration of the economic importance of botanical survey work. The list of species brought back—which, of course, does not include all those acutally seen and noted—is a valuable addition to our records. More than a dozen are altogether new to Natal and Zululand. Though it is hoped that further work in this area will be carried out in the near future, the present report is, I think, of sufficient importance to justify its publication as it stands, and I should like to recommend accordingly.

I have the honour to be,
Yours faithfully,

J. W. BEWS,
Botanist in Charge, Eastern Area.

BOTANICAL SURVEY OF NATAL AND ZULULAND.

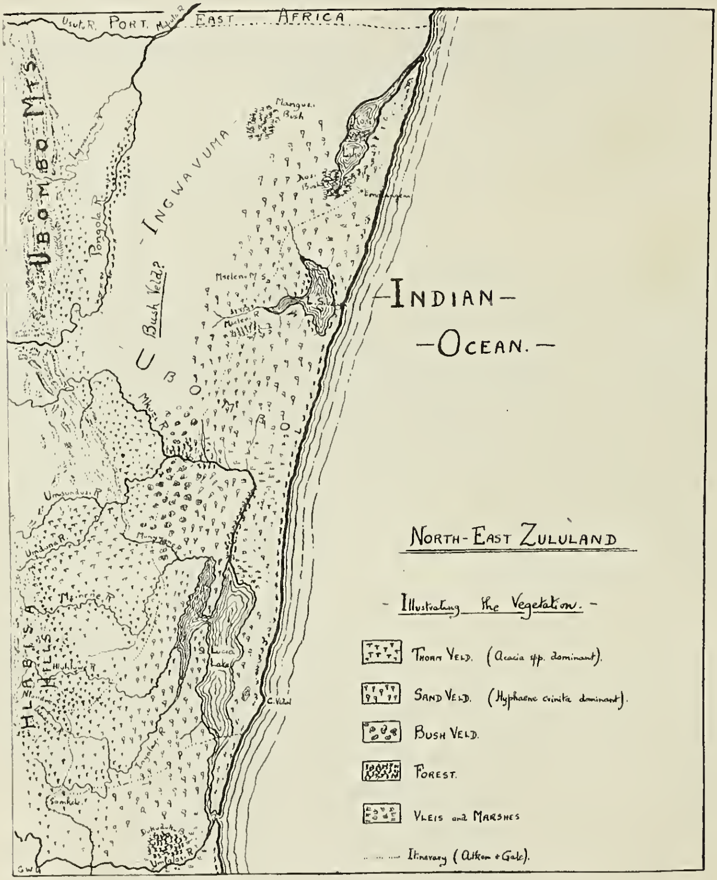
A RECONNAISANCE TRIP THROUGH NORTH-EASTERN ZULULAND.

By R. D. Aitken, M.Sc., and G. W. Gale, B.Sc.

I.—Outline of Itinerary.

A journey was undertaken by us from Somkele, the terminus of the North Coast railway line, to the Ingwavuma District, the most northerly in Zululand. The distance covered was approximately 100 miles north from Somkele. The means of transport was the only one possible in a country unoccupied by white settlers, viz., a wagon and a span of sixteen donkeys. Progress by this means is extremely slow; and more so since the road we followed is not a Government road, consequently receiving no attention from road-parties, and runs for a considerable distance through heavy sandy soil. Add to these circumstances the fact that fodder is unobtainable, and that in consequence considerable time has to be allowed each day for grazing —which in mid-winter and along the road is hard to get and poor in quality—and it will scarcely be surprising that a day's journey rarely exceeds twelve miles.

Commencing on the evening of 30th June from Somkele, we followed the " lower road " (as it is known locally) to Ntondweni Store and Mission Station, 12 miles distant. Eight miles farther on the Hluhluwe River was crossed, beyond which the road branches, one branch running in a north-westerly direction and traversing the hilly country east of Hlabisa Magistracy until it joins the main Government road from Somkele to Nongoma, 12 miles north of the Hlabisa Magistracy. The other branch, which we followed, runs more or less parallel with the coast at some distance (about 17 miles) inland. It crosses the Mzinene River about 16 miles north of the Hluhluwe, after running parallel to its right bank for some distance, the Munywane River (which marks the boundary between the Ubombo and Hlabisa Districts) 4 miles further on, the Mkuzi River 12 miles north of this, below its confluence with the Umsunduzi River, and finally the Mseleni River, which is 72 miles from Somkele. From here the road pursues a northward course, but after crossing the Mseleni (which we reached on 7th July) we left the road and trekked some 3 miles eastwards till we reached the Mseleni Mission Station, the first civilized dwelling seen since leaving Ntondweni, 60 miles to the south. The missionary in charge (Mr. O. E. Witt) entertained us most hospitably, and provided us with pack-donkeys and a guide, which enabled us in a day to travel some 25 miles to the north-east. Here, at Emalangeni, which is just south of Kosi Lake and near the sea, we stayed for two days, during which we paid short visits to the seashore and to the Kosi Bush. From this point we returned to Somkele, by the route we had come, and arrived there on 22nd July. From Somkele one of us travelled on foot to St. Lucia Lake and across it to the seacoast.



Vegetation Map of North-East Zululand.
(Scale : 20 miles to 1 inch.)

II.—Topography.

(1) *Physical Features.*—The area under survey belongs, geographically, to the "first terrace" or coast-belt of Natal, which widens more and more as one travels northward from the Tugela River owing to the north-easterly trend of the coast-line. It is bounded on the east by the Ubombo Mountains (2500 feet), which are a southward extension of the loftier Lebombo Range of Portuguese East Africa.

The Ubombo Mountains are interrupted at two "poorts"—through the northerly one flows the Pongola or Usutu River, and through the southerly the Mkuzi River. Southwards the Ubombo Range merges into the Hlabisa Hills (1000-1500 feet), and here the country is very broken. From this western boundary, which marks the edge of the "second terrace," the country falls away sharply to the east, although the slope is steeper in the north than it is in the south. Gently undulating country, never more than 500 feet in altitude, is succeeded to the east again by a belt of flat sandy country, some 10 miles wide, in which vleis and bogs are common. Before it reaches the sea, this belt is interrupted by so-called "lakes," which are really lagoons, much larger than but corresponding to the lagoons so common along the Natal coast. The chief of these is St. Lucia Lake, with its westerly inlet "False Bay," 30 miles long and from 8 to 2 miles broad; it tapers sharply at its southern end, which flows into the sea near the north of the Umfolosi River. This lake is fresh in its northern portion, brackish to the south, the tide ascending 10 or 12 miles. North of this lake is Lake Sibayi, which is strictly a lake, as it has no outlet to the ocean—at least, not above ground. North again is Kosi Lake, ill-represented on most of the maps. It really consists of a northerly lagoon, which drains into the ocean by a channel running north, and a southerly lake, into the lower end of which runs a short, but deep and wide, river. During the dry season a marsh separates the lagoon from the lake, but during the wet season their waters are continuous. All along the shore there runs the usual line of sandhills, attaining very considerable height along the narrow strip of land separating St. Lucia from the sea. The beach is generally sandy; east of St. Lucia it is rocky in several places.

The rivers flow from west to east. The longest and largest is the Mkuzi, which rises west of the Ubombo Mountains, and cuts through them; it is joined on its right bank by the Umsunduzi, which flows in a north-easterly direction from the southern end of the Ubombo Mountains. The Mkuzi flows into the north end of St. Lucia Lake, which might be called "the Mkuzi Lagoon." All the other rivers take their rise amongst the hills forming the western boundary of the area under description, and all those between the Mkuzi River and Somkele flow into St. Lucia Lake. The chief of these (from north to south) are the Mzinene, the Hluhluwe, and the Inyalazi. North of the Mkuzi is the Mseleni River, which is short, flowing into Lake Sibayi.

(2) *Soil.*—Where it is not sandy, the soil is everywhere of the compact, hard-baked type, and capable of producing good crops where well cultivated. In the district round the Hluhluwe River it is red in colour, elsewhere not so. In parts it is very stony, particularly along the foot of the Ubombo Mountains. Coastwards the soil is sandy, and north of the Mkuzi every inch of the country, except in a few places along the rivers where red and brown clays are obtained, is covered with deep white sand.

(3) *Climate.*—As in the rest of Natal, rain falls in the summer and not in winter. No figures could be obtained for rainfall, but it is fairly heavy in summer, and there is occasional rain even in winter. Along the strip of seacoast the winter rainfall is so considerable in its amount that the natives reap a small crop of mealies nearly every winter, making two in the year. As the river

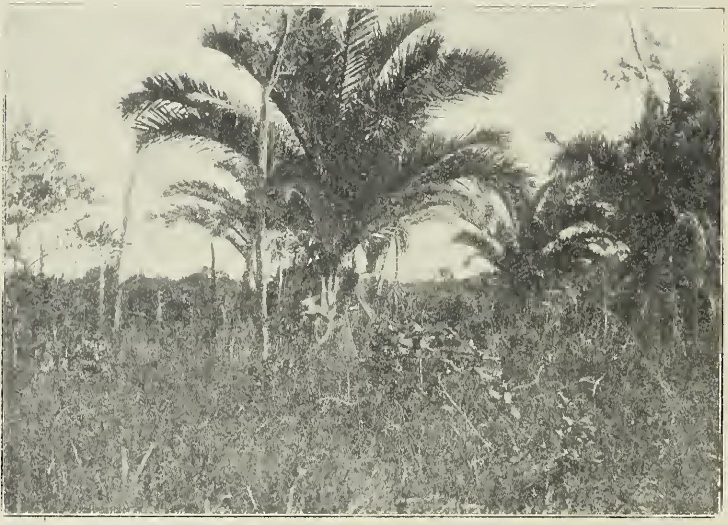


Plate I.

Raphia Palm in Kosi Bush.

Plate II.

Drift across the Mkuzi River.

valleys are not deep there are no winter mists. Dew is copious in its fall on most nights. The temperature never falls below freezing-point, except on rare occasions. Frost occurred at Somkele this year, and a native who had lived there all his life stated that he had never seen it before. During summer the heat is excessive, being intensified by the sandy soil; and even in July the days are hot, and the nights exceedingly mild.

III.—VEGETATION.

It was unfortunate that our survey had to be made in mid-winter, as at this time the necessary preliminary of floristic work was extremely limited in extent; only towards the coast and along river-beds were there any plants in flower, and these probably not representative of the flora as a whole. Nevertheless, the plants which were collected were sufficient to illustrate several suggestive ideas, and to indicate that a more intensive survey at a more suitable season might be of considerable interest from the purely floristic standpoint. None of the trees were in flower, but we are indebted to Dr. T. R. Sim for naming not a few of them from leaf and fruit specimens, and also for naming the ferns and the mosses. As intensive floristic work in any one district was impossible, we attempted to compensate for this by covering as large an area of country as possible with the means and in the time at our disposal. For these two reasons the following account of the vegetation is extensive rather than detailed.

(1) *Thorn Veld.*—Practically the whole of the region under survey which does not possess a sandy soil may be classed as thorn veld. All the country lying along the foot of the Ubombo Mountains, the area drained by the Umsunduzi River, and the Hlabisa Hills are covered with thorn veld. The route which we followed between the Hluhluwe and the Munywane Rivers lies along a boundary line separating the thorn veld on the west from the sand veld (see later) on the east. South of the Hluhluwe the thorn veld extends farther east than the road.

This type of vegetation is well known in Natal, and in Zululand scarcely differs from what it is there. The soil is everywhere of the dry, hard-baked type; the dominant grass is *Anthistiria imberbis* (in Sinde), with numerous species of *Andropogon*, *Eragrostis*, *Sporobolus;* the dominant trees are *Acacia* spp. (*A. horrida*, *A. arabica*, var. *kraussiana* = *A. benthami*), and in moistened places *A. caffra*, while *Sclerocarya caffra* is very common in many places, and also a tree Euphorbia (sp. near *ingens*). The trees grow closest together along the country lying just beneath the western mountain boundary and near the river. All the trees found in the open veld are found growing along the rivers, which form bases of colonization from which the trees migrate into the stretches of open country lying between the rivers; consequently the trees grow sparsely scattered in country midway between two rivers, and densely near each river. The natural succession, as Prof. Bews has shown, is towards a thorny scrub, which stage, however, is rarely reached, owing to the effect of grass fires—the grass (*Anthistiria imberbis*) grows to a considerable height everywhere in the thorn veld and burns readily. Scarcely a night during winter but that a grass fire is seen somewhere on the veld, and, as the country is not divided into farms, a single fire may rage for three days before it dies out. In the less populated districts this factor does not operate to the same extent, and it is precisely in these districts that one finds the climax staged in the thorn veld succession. In places, however, and especially in the valley of the Hluhluwe, the trees are gaining ground; for example, a native, who had lived in that district all his life, pointed to a hillside studded with thorn trees, and volunteered the information that in his childhood there had not been one tree there. In the immediate vicinity of Somkele the thorn trees have been ruthlessly cut down for firewood, and in consequence large Euphorbias [*E. ingens* (?)] have more or less taken their place, and lend a characteristic appearance to the landscape. Historical testimony goes to prove that formerly thorn trees were much more abundant round Somkele than they are to-day.

Along the rivers from Somkele to the Munywane the same type of vegetation occurs: the trees found out in the thorn veld, with an admixture of hygrophilous trees and shrubs which only rarely are found far away from the river-beds. Among the latter are *Phoenix reclinata* (very abundant in places), *Ficus* spp., *Eugenia cordata*, *Erythrina caffra* (in flower), *Vangueria infausta*, *Rauwolfia natalensis*, *Antidesma* sp., *Gardenia* sp., *Zizyphus mucronata*, *Schotia brachypetala*, and *Dombeya* sp. (pro. *rotundifolia*). *Euphorbia tirucalli* was observed along the stream banks, but very rarely far away from them. A vast number of herbs and undershrubs were present, very few in flower, and the majority of those that were proved to be tropical members of the Acanthaceae (*Justicia pulegioides*, *Dicliptera capensis*, *D. clinopodia*, *D.* sp., *Hypoestes verticillaris*. *Phaylopsis parviflora*, *Rubia cordifolia*, *Plumbago zeylanica*, *Adiantum capillus-veneris*, *Dryopteris prolifera*).

(2) "*Bush Veld.*"—North of the Munywane River, which is the northern boundary ot the Hlabisa District, we entered a country which differed in several respects from that preceding it, both as regards soil and vegetation. The soil is dry and very sandy; stones are never seen, and there are none of the little spruits common farther south. *Anthistiria imberbis* is replaced by a tufted wiry grass [*Aristida* (?)] and the singly occurring Acacias by a kind of thorny scrub, which probably represents a late stage subsequent upon the pioneer Acacias, which for the most part have been killed out by subsequent species. The clumps of bush are from 20 to 30 feet across and are composed of a large number of species, none of which were in flower, so that the composition of the scrub we cannot tell. Among the trees is *Terminalia sericea*, which is never met with farther south, but becomes more and more common farther north. This "bush veld," as we have termed it, lies between the Munywane and the Mkuzi Rivers. Scattered between the clumps of bush the following plants were observed in flower: *Aloe* spp. (common), *Kalanchoe rotundifolia* (in shade at edge of clumps), *Lessertia brachystachya*, *Iboza galpini*, *Senecio* sp., *Lasiosiphon* sp., *Asparagus* sp., *Gazania longiscapa*.

(3) *Sand Veld or "Ilala Veld."*—In the sketch of the topography reference has already been made to this belt of sandy country, some ten miles wide (wider farther north in Tongoland), and running parallel with the coast, but separated from it by the lakes or lagoons. This country is all very flat, although in the Ingwavuma District (which is almost wholly occupied by it) it is hummocky in many places. It is at an elevation only slightly above sea-level, and consequently, though the soil is sandy, drainage is poor, and water (always brackish) can be obtained by digging only a few feet below

the surface. A drop of even a few feet results in the formation of vleis and bogs, which are numerous, especially toward the coast: these are more extensive in summer than in winter, when they frequently dry up almost completely. Sluggish streams, which often fail to find their way to the sea, are also frequent, and along them develops a typical hygrophilous bush.

Typically, the vegetation of the sand veld consists of grassland [*Aristida* (?) dominant—not *Anthistiria*—there are bare patches of sand between the tufts of grass] dotted over with the "ilala" palm, *Hyphaene crinita*. The latter grows in little clumps of four or five, the clumps being separated from each other by fairly regular intervals of from five to six yards (see photo). In many parts of this ilala veld there are no other tree forms to be met with—whereas in other parts a number of trees may be scattered through the veld at distances of from twenty to a hundred yards from each other. These (named roughly in order of relative abundance) are: *Strychnos* sp. (small tree), *Strychnos spinosum*, *S. geradi*, *Eugenia cordata*, *Terminalia sericea*, *Sclerocarya caffra*, *Euphorbia* sp. [*ingens* (?)], *Apodytes dimidiata*, *Podocarpus latifolia*, *Trichilia emetica*, while towards the coast *Phoenix reclinata* and *Strelitzia augusta* become very common, growing in large clumps. All these species migrate into the ilala veld from the bush growing near water-courses; they grow up in the shade of the ilala palms, which they subsequently kill by shading them: Hyphaene demands intense sunlight. It seems at first sight somewhat remarkable that a tree like *Eugenia cordata* should be growing several miles away from the nearest water, but it must be remembered that water can be obtained at no very great depth by the roots, even in mid-winter. The critical period in the establishment of such a tree must be at the time when the root system has not yet reached the subterranean water-level, and the sapling depends solely on surface water, which in a sandy soil can never be great in amount. This fact, coupled with the prevalence of veld fires which destroy such saplings, probably accounts for the comparative scarcity of trees in a country where trees, once established, can always obtain water, and are green even in mid-winter and amid such arid surroundings.

In addition to these plants, which depend on this hidden water-supply, there must in spring-time, when the surface soil is moistened, be a vast herbaceous flora which probably would contain many novelties; for wherever one digs into the sand, one finds a mass of bulbs, corms, tubers, rhizomes, and such-like storage organs. Even in winter-time, quite a number of such plants were in flower (several in a dried-up vlei), the list being as follows: *Juncus* sp., *Hebenstreitia comosa*, *Lissochilus clitellifer*, *Hypoxis villosa*, *Jatropha* sp., *Gymnosporia* sp., *Eugenia albanensis*, *Scilla* sp., *Lobelia tomentosa*, *Senecio* sp., *Dicliptera capensis*, *Manulea* sp., *Gazania longiscapa*, *Euphorbia epicyparissias*, *E.* sp. [*genistoides* (?)], *Gerbera ambigua*, *Anthericum* sp., *Convolvulus* sp., *Polygala oppositifolia* var., *Othonna carnosa*, var. *discoidea*, *Anoiganthus brevifolius*, *Cyrtanthus* sp. [*galpini* (?)], *Gladiolus papilio*, *Dianthus* sp., *Helichrysum parviflorum* (very common in places).

The boundary line between the thorn veld and this ilala veld, which runs from north to south, is not very sharp, and indeed Hyphaene often extends into the thorn veld, but only where it is fairly open.

The vleis and marshes are filled with a Cyperus-Erianthus association (*Cyperus latifolius* and *Erianthus capensis*). Along the streams a typical hygrophilous bush develops, in which *Eugenia cordata* is one of the commonest trees, while conspicuous in the undergrowth is a large fern—*Stenochlaena tenuifolia*. The streams are nowhere very large, but they are numerous, so that there is a considerable amount of this hygrophilous bush, which, however, never extends any distance away from the water.

On the banks of the two largest rivers which flow through the sand veld, viz., the Mkuzi and the Mseleni, there has developed a fairly thick bush, extending a mile or two from each bank. Along the river-banks grow fine specimens of the genus Ficus, while away from them grow such trees as *Schotia brachypetala*, *Sclerocarya caffra*, *Terminalia sericea*, *Strychnos spinosum*, *Strychnos gerrardi*, *Combretum* sp., *Voacanga dregei*, *Gymnosporia buxifolia*, *Acacia* spp., and *Trichilia emetica* (commoner in Mseleni Bush), *Euphorbia ingens* (?) (commoner in Mkuzi Bush), and a number of other trees we could not identify. There is not a very rich undergrowth, but lianes and scramblers are fairly common—among the latter is *Euphorbia tirucalli*. Along the right bank of the Mkuzi River, and on the outer edge of the bush lining it, *Acacia xanthophloea* Benth., which is a lofty, rather handsome tree with a sickly-yellow bark, is not uncommon. It is called by Europeans the "fever tree" (Zulu name, umHlosinga), and its presence is popularly supposed to indicate fever localities. There may be some truth in this, as it never grows but in low-lying, clayey soil.

(4) *Lakes.*—The three lakes, St. Lucia, Sibayi, and Kosi, occupy areas which otherwise would be occupied by the sand veld, as the spaces between them are. As regards vegetation, all three are similar. Back from their shores extends a narrow strip of bush, in which *Eugenia cordata* is prominent in the case of St. Lucia, while *Terminalia sericea* is most prominent along the shores of Lake Sibayi. In the marginal belt between water and dry land there occur numerous Cyperaceae, but the dominant plant here is the cosmopolitan *Phragmites communis*, which lines the shores of St. Lucia for many a mile, and extends several hundred yards into the water. There are a very few places along St. Lucia Lake where the Zululand papyrus (*Cyperus papyrus*), which is so plentiful along the Umfolosi River, occurs in quantity.

We did not visit more than the southern end of Kosi Lake, where we found that true forest occurs.

(5) *Forest.*—In the whole of the region under survey, true forest only occurs, so far as we know, in two places, and these both in the far north. Here there is the "Manguzi Bush" of fairly wide extent, which we did not visit but from which we obtained fruits of the so-called "Mahogany Bean" (*Afzelia quanzensis* Welw.), thus indicating that it grows there (in fair abundance, according to report). This tree occurs in Portuguese East Africa (*vide* Sim's "Forest Flora and Forest Resources of Portuguese East Africa"), and its presence here indicates that the forest in northern Zululand is probably distinctly sub-tropical in its composition, far more so than any farther south. This impression was confirmed when we visited the forest which has developed around the southern end of Kosi Lake, through the centre of which runs the Kosi River. There is a great wealth of varied vegetation, no single species being dominant,

including a number of ferns, among which is *Lygodium scandens.* Unfortunately, no floristic work was possible, and consequently no account can be given of the species which occur. In the heart of this forest we made the interesting discovery of a species of Raphia, probably near, but not identical with *R. vinifera* (*vide* notes on Raphia in the appended list of plants collected).

(6) *Strand Vegetation.*—At the most northerly point of our journey we touched the seacoast. Here the vegetation is no different from that found farther south, illustrating the principle that strand plants are widely distributed. On the belt of shifting sand between the sea and the sand-dunes (here about 50 feet high), we observed *Scaevola lobelia* and *Ipomoea biloba* (*I. pes-caprae*), with *Mesembryanthemum edule* straggling from here right up into the psammophilous bush, which clothed the sand-dunes. In this bush the dominant tree was *Mimusops caffra*, while farther back *Strelitzia augusta* was dominant. *Osteospermum moniliferum* was present, also *Aloe thraskii*, in considerable numbers. Just back of the sand-dune bush we found a few specimens of Encephalartos, and plants of the same species occurred within the bush itself, one of them bearing two fine brilliant red female cones. *Asystasia coromandeliana* was very common as an associated plant, while the fern *Polypodium phymatodes* was present in abundance.

Along the seashore we observed fruits of *Barringtonia racemosa* and *Entada scandens*, which had been washed up by the waves, and at one place *Sporobolus pungens* growing on some rocks. Several Algae were collected here, and a large number more from rocks near Lake St. Lucia, which one of us afterwards visited, and where the shore vegetation is essentially similar to that already described.

IV.—List of Plants Collected.

In the following list of plants collected there are some thirteen or fourteen species (asterisked) which have not been previously recorded (in Medley Wood's Revised Lists) for Natal and Zululand. In one or two cases the determination of the species is doubtful, and the number may perhaps be reduced to twelve. Of the species thus recorded for the first time, five are recorded for the Cape in the "Flora Capensis," and are probably identical with undetermined species given in Wood's lists.

Forty-four per cent. (38 out of 87) of the total number of species (excluding the Algae) recorded occur also in tropical Africa, which bears out the conclusion arrived at by Prof. Bews in a recent paper that the Natal coast-belt is distinctly sub-tropical in its affinities. In this connection our record of Raphia, Afzelia, Cajanus, and Terminalia—genera new to Natal, but common in the tropics—is very interesting.

Another point that suggests itself is the connection between the flora of the Natal coast-belt and the flora of the northern Transvaal. That this connection exists is well known, and also that the connection is *not* by way of the Natal midlands, but probably eastward from the northern Transvaal and down into Natal along the border of Portuguese territory. Our trip took us some distance along this "line of invasion," and we met with *Dombeya pulchra*, *Iboza galpini*, and the well-known *Terminalia sericea*—all species which are not known in Natal proper, but which are common enough in the Transvaal. It may be that what we have called "bush veld" in our report really does represent an *outlier of the Transvaal bush veld; Terminalia sericea* and *Combretum* sp. both occur in it, and *Aloe* spp. are common between the clumps. If this hypothesis is correct, one would expect to find this bush veld formation extending northwards from the Mkuzi, and occupying the country between the thorn veld on the west and the sand veld (in which also Terminalia is common) on the east. Our itinerary took us to the east of this route, through the sand veld, and therefore the hypothesis suggested still requires to be put to the test.

The prefixed numbers in the following list are our collecting numbers. Species asterisked are those not recorded in Medley Wood's lists. Localities are given with each species.

1.—FLOWERING PLANTS.

POLYGONACEAE.

(53) *Oxygonum dregeanum* Meisn.—Old mealie-field, E. Ingwavuma, 100 ft.

AMARANTACEAE.

(22) *Gomphrena globosa* Linn.—Old garden, N. Hlabisa, 400 ft.

(10) Undetermined species.—Old mealie-field, L. Sibayi, E. Ingwavuma, 150 ft.

CARYOPHYLLACEAE.

(34) *Dianthus* sp.—Open sandy veld coastwards, E. Ingwavuma, 100 ft.

CAPPARIDACEAE.

(29) *Niebuhria (Maerua) rosmarinoides* Sond.—Near Euphorbia clump, Somkele, Hlabisa, 500 ft.

(50) *Cadaba natalensis* Sond.—Liane over Euphorbia clump, Somkele, Hlabisa, 500 ft.

(28) *Capparis guenzii* Sond.—Liane over Euphorbia clump, Somkele, Hlabisa, 500 ft.

CRASSULACEAE.

(42) *Kalanchoe rotundifolia* Harv.—Common in shade near bushes, Hlabisa and Ubombo, 500-300 ft.

LEGUMINOSEAE.

*(1) *Lessertia brachystachya* DC.—Open veld, S. Ubombo, 400 ft. Recorded in "Flora Capensis" for Cape Colony, but not in Wood's lists for Natal.

*(21) *Cajanus indicus* Spreng.—Edge of old mealie-field, Ubombo, 300 ft. A monotypic genus, not recorded in "Flora Capensis" for South Africa. According to the "Flora of Tropical Africa," it is met with and cultivated everywhere in the tropics, yielding edible pea-like seeds. Whether cultivated in Zululand we cannot say, but the locality in which we found it suggests that it is. Whether it is or no, it at least can be, and therefore may prove to be of some economic importance.

(68) *Schotia brachypetala* Sond.—Leaves only. Dominant tree in Mkuzi Bush, Ubombo, 300 ft.

POLYGALACEAE.

*(31) *Polygala oppositifolia* Linn., var. nov.(?).—Open sandy veld coastwards, E. Ingwavuma. 100 ft.

EUPHORBIACEAE.

(33) *Euphorbia epicyparissias* E. Mey.—Open sandy veld coastwards, E. Ingwavuma, 100 ft.

*(32) *Euphorbia* sp. (near *genistoides* Hiern.).—Open sandy veld coastwards, E. Ingwavuma, 100 ft. *E. genistoides* is not given in Wood's lists; Cape in "Flora Capensis."

(17) *Jatropha* sp.—Leaves only. Herb in ilala veld, N. Ubombo, 300 ft.

(64) *Antidesma* sp.—Leaves only. Tree in bed of Munywane River, S. Ubombo, 400 ft.

CELASTRACEAE.

(23) & (24) *Gymnosporia buxifolia* Linn. (Zulu, isiHlango).—Common near bush, Hlabisa to Ubombo, 800 ft.-200 ft.

(54) *Gymnosporia* sp.—Leaves only. Near edge of bush, E. Ingwavuma, 100 ft.

(16) *Gymnosporia* sp.—Leaves only. Common in ilala veld, N. Ubombo, 300 ft.

TILIACEAE.

(20) *Corchorus trilocularis* Linn.—Old mealie-field, Ubombo, 300 ft.

STERCULIACEAE.

(80) *Dombeya* sp. (prob. *rotundifolia* Harv.).—Leaves only. Bed of Munywane, S. Ubombo, 400 ft.

*(83) *Dombeya pulchra* N. E. Br.—Leaves and fruit only. Near thorn-clumps, Hlabisa, 800 ft.

THYMELEACEAE.

(60) *Gnidia microcephala* Meisn.—Open sandy veld coastwards, E. Ingwavuma, 100 ft.

COMBRETACEAE.

*(79) *Terminalia sericea* Burch. (Zulu, iNkonono).—Leaves only. Ubombo and Ingwavuma Districts only, 400-200 ft.

(87) *Combretum* sp.—Leaves and fruit only. Mkuzi Bush and in bush veld, Ubombo, 400-300 ft.

MYRTACEAE.

(69) *Eugenia albanensis* Sond.—Leaves only. Common in ilala veld, N. Ubombo, 300 ft.

ONAGRACEAE.

(57) *Jussiaea* sp. (prob. *repens* Linn.).—Marsh near L. Sibayi, E. Ingwavuma, 150 ft.

CERATOPHYLLACEAE.

(84) *Ceratophyllum* sp.—Leaves only. In L. Sibayi and in Kosi R., E. Ingwavuma, 150 ft.

PLUMBAGINACEAE.

(12) *Plumbago zeylanica* Linn.—Bed of Munywane, S. Ubombo, 400 ft.

SAPOTACEAE.

(74) *Mimusops caffra* E. Mey. (Zulu, Mapisi).—Leaves and fruit only. Dominant in sand-dune bush, coast, E. Ingwavuma.

APOCYNACEAE.

(5) *Carissa arduina* Linn.—Margin of bush, shores of Sibayi, E. Ingwavuma, 150 ft.

(2) *Acocanthera spectabilis* Hook. f.—Climber over clumps of bush, S. Ubombo, 400 ft.

(88) *Rauwolfia natalensis* Sond.—Along bed of Munywane, S. Ubombo, 400 ft.

(72) *Voacanga dregei* E. Mey.—Leaves and fruit only. Mkuzi Bush, common, Ubombo, 300 ft.

CONVOLVULACEAE.

(85) *Ipomoea albivenia* D. Don.—Fruit only. Climber in Kosi Bush, E. Ingwavuma, 100 ft.

LABIATAE.

*(49) *Iboza galpini* N. E. Br. (Zulu, iBozane).—Bush veld, S. Ubombo, 400 ft. (used medicinally by natives).

(48) Undetermined species.—Common along bed of Munywane, N. Hlabisa, 400 ft.

SOLANACEAE.

(30) *Lycium* sp. (prob. *pendulinum* Miers.).—Near Euphorbia clump, Somkele, Hlabisa, 500 ft.

SCROPHULARIACEAE.

(61) *Manulea* sp.—Open sandy veld coastwards, E. Ingwavuma, 100 ft.

(40) *Hebenstreitia comosa* Hochst.—Open sandy veld coastwards, E. Ingwavuma, 100 ft.

(47) *Striga orobanchoides* Benth.—Parasitic on roots of *Euphorbia ingens* (?), S. Ubombo, 400 ft.

ACANTHACEAE.

(26) *Phaylopsis parviflora* Willd.—Bed of spruit, Hlabisa, 500 ft.

(36) *Asystasia coromandeliana* Nees.—Common in sand-dune bush, coast, E. Ingwavuma.

(13) *Hypoestes verticillaris* R. Br.—Bed of Munywane, S. Ubombo, 400 ft.

(15) *Justicia pulegioides* E. Mey.—Bed of Munywane, S. Ubombo, 400 ft.

*(19) *Dicliptera capensis* Nees.—Roadside, open veld, S. Ubombo, 400 ft. (Cape, in "Flora Capensis)."

(25) *Dicliptera clinopodia* Nees.—Common along spruits, Hlabisa, 400 ft.

(14) *Dicliptera* sp.—Bed of Munywane R., S. Ubombo, 400 ft.

(7) Undetermined species.—Margin of bush, shores of L. Sibayi, E. Ingwavuma, 150 ft.

RUBIACEAE.

(37) *Tricalysia* (*Kraussia*) *lanceolata* Sond.—Kosi Bush, E. Ingwavuma, 100 ft.

(65) *Gardenia* sp.—Leaves only. Tree in bed of Munywane, S. Ubombo, 400 ft.

(67) *Vangueria infausta* Burch.—Leaves only, galls on them. River valleys, Hlabisa, 400 ft.

(6) *Galopina circaeorides* Thunb.—Margin of bush, shores of L. Sibayi, E. Ingwavuma, 150 ft.

(27) *Rubia cordifolia* Linn.—Scrambler over undergrowth, spruits, Hlabisa, 500 ft.

CAMPANULACEAE.

*(35) *Lobelia tomentosa* Linn.—Open sandy country and near bush, E. Ingwavuma, 100 ft.

COMPOSITAE.

(52) *Mikania capensis* DC.—Scrambler in Kosi Bush, E. Ingwavuma, 100 ft.

*(55) *Helichrysum obvallatum* DC.—Old mealie-field near coast, E. Ingwavuma, 100 ft. May be identical with one of several undetermined species of Helichrysum recorded by Medley Wood.

(56) *Helichrysum parviflorum* Less. (Zulu, isiQoqo).—Common in open sandy veld coastwards, E. Ingwavuma, and also near L. St. Lucia, 100 ft.

(46) *Senecio* sp.—Scrambler in bush along Mseleni R., N. Ubombo, 200 ft.

(18) *Senecio* sp.—Bush veld north of Munywane, S. Ubombo, 400 ft.

(59) *Senecio* sp.—Open sandy veld coastwards, E. Ingwavuma, 100 ft.

(8) & (9) *Osteospermum moniliferum* Linn.—Sand-dune bush, E. Ingwavuma and near St. Lucia Lake.

(45) *Othonna carnosa* Less., var. *discoidea* Oliv.—Open sandy veld coastwards, E. Ingwavuma, 100 ft.

(62) *Gerbera ambigua* Sch. Bip.—Open sandy veld coastwards, 100 ft.

PALMAE.

*(82) *Raphia* sp. [*vinifera* (?) Beauv.].—Leaves and fruits only. This palm occurs only in one locality, in the Kosi Bush, on the west side of the Kosi River. Here it is plentiful and well established, growing to a height of 80 feet or so. It undoubtedly belongs to the genus *Raphia*, the fruit being covered with regular rows of scales. The key to the species in the "Flora of Tropical Africa" depends on the number of stamens in the flower, which we did not obtain. But the vegetative and fruit characters bring it under *Raphia vinifera*, except that the fruit scales are *not* green, nor slightly fimbriate along the margin, as in the description given of the species. So that either this palm is a variety of *R. vinifera*, or it may be a new species of the genus.

These palms have not been exploited commercially, although the fibre produced from them would be valuable. The natives do not use the fibre (either through ignorance of its value, or because they prefer the ilala palm for weaving fibres), but the mid-ribs of the leaves, which near the base are as thick as a man's arm, are cut into lengths and used for fencing and for building rafts. We crossed the Kosi River in a raft made entirely of this material.

The palms grow in damp marshy soil (in which the natives grow rice), and are not very easy of access. Nevertheless, they are only some ten miles distant from the Maputa Store (native trading station), and there is no reason why, if the fibre is of use, natives should not be hired to cut and carry it to the store, whence it could be transported to railhead in wagons which are continually going down to Somkele *empty* in order to bring up trade goods.

LILACEAE.

(86) *Dracaena hookeriana* K. Koch.—Fruit only. Kosi Bush. E. Ingwavuma, 100 ft.

AMARYLLIDACEAE.

(43) *Anoiganthus brevifolius* Baker.—Dried up vlei near coast, E. Ingwavuma, 100 ft.

(44) *Cyrtanthus* sp. (near *galpini* Baker).—Open sandy country coastwards, E. Ingwavuma, 100 ft.

IRIDACEAE.

(4) *Lapeyrousia* sp. [*cruenta* (?) Baker].—Pretty blue flower, common near bush right on the coast.

(58) *Gladiolus papilio* Hook. f.—Dried-up vlei near coast, E. Ingwavuma, 100 ft.

(51) *Gladiolus* sp.—Near coast (E. Ingwavuma), right on shore, St. Lucia.

(41) Undetermined species.—Dried-up vlei near coast, E. Ingwavuma, 100 ft.

ORCHIDACEAE.

*(38) *Eulophia speciosa* (Sold.) Bolus.—Kosi Bush, E. Ingwavuma, 100 ft.

(39) *Lissochilus clitellifer* Recht.—Open sandy veld coastwards, Ubombo and Ingwavuma, 200-100 ft.

CYCADACEAE.

(63) *Encephalartos* sp.—Right on coast and in sand-dune bush, E. Ingwavuma.

2.—FERNS.

POLYPODIACEAE.

(70) *Dryopteris prolifera* (Retz.) C. Chr.—Hluhluwe River, Hlabisa, 500 ft.

(77) *Dryopteris sylvatica* Pappe and Rawson.—Vegetative only. Kosi Bush, E. Ingwavuma, 100 ft.

(78) *Dryopteris* sp.—Swamp adjoining L. Sibayi, S. Ingwavuma, 150 ft.

(76) *Nephrolepis biserrata* (Sw.) Schott.—Kosi Bush, E. Ingwavuma, 100 ft.

(73) *Stenochlaena tenuifolia* (Desv.) Moore.—Vegetative only. In hygrophilous bush near coast from St. Lucia Lake to E. Ingwavuma, where our specimen was collected. 100 ft.

(71) *Adiantum capillus-veneris* Linn.—Bed of spruit, Hlabisa. 500 ft.

(75) *Polypodium phymatodes* Linn.—Sand-dune bush, E. Ingwavuma.

(78) Undetermined species.—Vegetative only. Kosi Bush. E. Ingwavuma, 100 ft.

SCHIZAEACEAE.

(3) *Lygodium scandens* (Linn.) Sw.—Kosi Bush, near river, E. Ingwavuma, 100 ft.

3.—MOSSES.

**Amblystegium riparium* (Linn.) Br. Em., var. *rivulare*.—Covering dead tree-trunks lying half in the water, Kosi River, E. Ingwavuma. 100 ft.

Ptychomitrium crispatum Horns.—Growing in shore bush, E. Ingwavuma, sea-level.

Bryum canariensiforme Dixon.—Vegetative only. Kosi Bush, E. Ingwavuma. 100 ft.

4.—ALGAE.

Some 40 *spp. of Brown, Red, and Green Algae* were collected on the rocks at low tide, both at Emalangeni (E. Ingwavuma) and near St. Lucia Lake. The names of these have not yet been determined.

UNION OF SOUTH AFRICA

BOTANICAL SURVEY OF SOUTH AFRICA

MEMOIR No. 3

INTRODUCTION TO

SOUTH AFRICAN CYPERACEAE

By S. SCHÖNLAND, Hon. M.A. (Oxon), Ph.D., C.M.Z.S., F.R.S. (S.Afr.), Professor of Botany, Rhodes University College, Grahamstown; Keeper of the Herbarium of the Albany Museum; and Botanist in Charge of the South-Eastern Area, Botanical Survey

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THE SECRETARY FOR AGRICULTURE.

I have the honour to transmit herewith the manuscript of a very comprehensive paper by Professor Schönland entitled "Introduction to South African Cyperaceae," and I recommend that it be published as Memoir No. 3 of the Botanical Survey of South Africa.

The paper in its present form represents the essence of years of intense study of a most difficult group of plants, and the publication of this paper will make generally available much valuable and long-needed information, as a knowledge of the South African Cyperaceae is essential in the study of the relations of sour veld and sweet veld. Furthermore, the Pica investigations which are now being undertaken by the Department of Agriculture will be greatly assisted if the complexities of this order are made clear and accessible to workers in systematic botany. Apart from this, the Cyperaceae also play a very important rôle in the prevention and cure of soil erosion in South Africa.

No English publication exists in which the morphology of the vegetative organs, the inflorescences or flowers is treated so thoroughly; hence the need for such a publication requires no further comment.

I. B. POLE EVANS,
Director.

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FOREWORD.

UNTIL about eight years ago, I had given very little attention to South African *Cyperaceae*. Like other botanists, I had thought it best to leave them to specialists. Circumstances, however, compelled me to get the *Cyperaceae* of a portion of South Africa determined. and, as I could not get any expert assistance, I had to perform the task myself. Fortunately, there were a number of types and co-types available in the Herbarium of the Albany Museum, and these formed a nucleus from which I could proceed with the aid of the "Flora Capensis." I soon found that the species are, broadly speaking, as well or even better defined than in any other natural order with which I had specially occupied myself, but that very close attention has to be paid to keys and descriptions if these are to lead to satisfactory results. I also worked through the collection of the National Herbarium, Pretoria, and during the last two years I have, through the kindness of Mrs. F. Bolus and Dr. L. Peringuey, been able to examine the whole of the material of the Bolus Herbarium and of the Cape Government Herbarium. These contained a large number of additional types and co-types. A number of others were kindly lent by Dr. Van der Bijl, in charge of the Natal Government Herbarium. As a result, I think I am well acquainted now with the large majority of the species described in the "Flora Capensis," and no doubt more material has gone through my hands than has ever been at the disposal of any previous worker. There is, however, still a residue of undetermined material, partly no doubt referable to described species, and partly of new species and perhaps a few new genera. In the elucidation of these I have been promised the co-operation of Mr. Turrill, of Kew, with the kind permission of the Director. The present publication has for its first object to put the beginner in a similar position from which I started—namely, to give him a nucleus of well-determined species by a number of faithful illustrations. These were drawn under my directions by Miss Stella Gower. I have illustrated every genus mentioned in the "Flora Capensis," and as far as possible every section of the larger genera. In making the dissections represented on the plates, valuable assistance was rendered by my assistant, Miss O. Hilner, B.A., but every one was independently checked by myself. I would like to take this opportunity of acknowledging the help received from Miss Hilner in making innumerable other dissections, and the sound judgment which she has frequently displayed in discriminating between closely allied species.

I have thought it best to give the genera in the order in which they are placed by the late Mr. C. B. Clarke in the "Flora Capensis," because it will facilitate easy reference to this work. Only one genus, *Courtoisia*, dealt with is not included in it. I felt very much inclined to follow other authors in delimitating the genera in a way different from that followed by Clarke, but on the whole I found that nothing was gained by this procedure—e.g., if we include *Mariscus* as a subgenus in *Cyperus* we simply enlarge this already unwieldy genus, and we have still to look for the differences which separate *Mariscus* from the other subgenera. I have made an exception in the case of *Schoenoxiphium* and *Carex*, which I have accepted in the limits given to them by Kükenthal in his monograph of *Caricoideae ;* but even then I am not satisfied that this author's delimitation is quite a happy one. However, it is easy to find fault with their conclusions : it is quite a different matter when one wants to put something better in their places.

The greater part of the text of this paper consists of remarks on the genera, including an account of their geographical distribution, the descriptions of the plates, the S.A. material of the species illustrated, their geographical distribution, and here and there remarks on them. In the latter, especially, it will be frequently found that I differ on certain points from Clarke. I should, however, like to dispel the wrong impression which might thus be created. In the first place, I do not repeat the greater part of the information given in the "Flora Capensis." If this were done, it would at once be seen that agreements would largely outweigh the differences. In the second place, the latter are of two kinds. They are either differences of opinion, for which Clarke himself has left many a loophole, or they consist in presentation of facts. Naturally, the more material one has and the more attention one can give to the flora of a single country, the easier it is to get at facts. Having had such a wide opportunity of judging Clarke's work on *Cyperaceae* in the "Flora Capensis," perhaps I may be allowed, in concluding these preliminary remarks, to say that nobody before him had such a grip on them as Clarke, and that it is not likely that anybody in future can deal with them with such profound knowledge of the *Cyperaceae* of the world and such almost unfailing tact. His work forms a firm foundation on which it is comparatively easy to build. I owe these remarks to the memory of a great botanist and one of the kindest of men it has ever been my privilege to meet.

INTRODUCTION TO

South African Cyperaceae.

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Morphological Notes.

Vegetative Organs.

All South African *Cyperaceae* are herbs—in fact, there is only one of the *Cyperaceae* of tree-like habit, namely, *Schoenodendron* Engl., from the Cameroons. They range in size from one or a few inches—e.g. *Cyperus tenellus* L.f., *Scirpus setaceus* L., *Sc. venustulus* Boeck. and its allies—to a height of five feet or more—e.g. *Cyperus immensus* C. B. Cl., *Carpha glomerata* Nees, species of *Tetraria*, *Cyperus madagascariensis* R. et S., the last reaching a height of twelve feet, and even *Tetraria Rottboellii* C. B. Cl. may reach a height of ten feet. Many of them are described as annuals. In a sense, this is right, as normally these do not last more than one season; but all of them possess methods of vegetative reproduction, and under favourable conditions even these so-called annuals may perennate. However, few field observations on this point are as yet available. The vegetative organs enable us to divide our *Cyperaceae* into four groups, which, however, have no systematic value:—

(1) Forms with elongated, branched, many-noded stem (e.g. *Ficinia*, sect. *Acrolepis*, *F. longifolia* C. B. Cl., *F. capillifolia* C. B. Cl., *Scirpus* subgen. *Fluitantes*). These may root at the nodes, and may multiply by the older part of the stem dying off and setting the branches free.

(2) Small tufted forms producing branches at the base, which develop like the main stem without forming a distinct rootstock or elongated rhizome (e.g. *Cyperus tenellus* L.f., *Scirpus sororius* C. B. Cl. and its allies).

(3) Larger tufted forms, in which is found a distinct rootstock (*caudex*), from which numerous aerial stems arise. These are very common, and many of them will be found illustrated in this paper. In *Ficinia bulbosa* Nees (Plate L), the rootstock is tuberous.

(4) Forms with a distinct elongated rhizome. These are also very common, as will be seen on reference to the illustrations.

Special methods of vegetative reproduction are by means of:—

(*a*) Stolons.—Frequently found in species with rootstock, though not always developed even when they normally occur (compare Plates XLVI and XLVIII).

(*b*) Bulbs.—Known only in *Scirpus bulbiferus* Boeck. (as shown clearly in Zeyher 1777, preserved in the Herbarium of the S.A. Museum) and *Cyperus usitatus* Burch. (Plate XVII). (In some species, e.g. *Mariscus capensis* Schrad. and its allies, the lower portion of the stem becomes bulb-like owing to the swelling of the leafsheaths. Stem bases resembling bulbs are also found in some species of *Scleria*.)

(*c*) Tubers.—In *Cyperus esculentus* L. and *C. rotundus* L.

The large majority of S.A. *Cyperaceae*, as of the order generally, is quite glabrous. However, there are a number in which the glumes are more or less hairy. Aerial stems and leaves may be scabrous or even conspicuously hairy, e.g. in *Scleria hirtella* Sw., species of *Bulbostylis* and *Fimbristylis*, and even more so in some species of *Fuirena*. Each rhizome turns upwards to form an aerial shoot, while generally subterranean branches continue the rhizome. The same complications which have been described by Celakowsky and Pax for European *Cyperaceae* occur in numerous South African ones (compare Pax in Engler and Prantl, Natürliche Pflanzenfamilien, II, 2, 99). Firstly, very frequently sympodia are formed; secondly, the axillary branches are frequently united for a short distance with the parent shoot; and thirdly, accessory shoots, which often act as innovation shoots, are common.

The aerial stems (the culms) are usually upright, and not branched, except in the floral region. The culms are always solid and frequently trigonous or triquetrous. In *Epischoenus quadrangularis* C. B. Cl. they are quadrangular. Terete or subterete stems are not infrequent in S.A. *Cyperaceae*, e.g. in *Juncellus laevigatus* C. B. Cl., *Cyperus textilis* Thunb., *Costularia*, many species of *Tetraria*, *Macrochaetium Dregei* Steud. In *Chrysithrix capensis* L. they are conspicuously flattened at the top. The leaves are frequently basal, one long internode separating them from the terminal inflorescence, but so-called "leafy stems" occur, e.g. in *Pycreus Mundtii* Nees, species of *Cyperus*, *Scirpus*, *Ficinia*, *Fuirena*, *Tetraria*, and in *Rhynchospora*, *Carpha*, *Ecklonia*, *Scleria*, *Schoenoxiphium*, and *Carex*. The leafsheaths are usually closed. They are open in *Lipocarpha*, *Ascolepis*, *Eriospora*, and occasionally also in *Fuirena* and *Scleria*. Ligulate structures, sometimes very similar to those of grasses, are found in *Fuirena*, *Eriospora*, and *Scleria* (also in some species of *Carex* outside South Africa). Sometimes, e.g. in *Ficinia ixioides* Nees and *F. scariosa* Nees, the sheath is conspicuously scarious-edged. The leafblade may be absent or very much reduced, e.g. in *Juncellus laevigatus* C. B. Cl., some species of *Cyperus*, *Eleocharis*, *Scirpus nodosus* Rottb. and its allies, *Ficinia aphylla* Nees, but in *Juncellus laevigatus* C. B. Cl. and species of *Cyperus* the blade may even in these normally "leafless" species be developed in some specimens. The blades are frequently flattish, "grass-like," canaliculate within, more or less carinate on the back, and very often scabrous on edge and keel. Often, however, they are setaceous in the smaller forms; in *Juncellus laevigatus* C. B. Cl., when developed, they are terete-trigonous. They are very peculiar in *Ficinia truncata* Schrad. (Plate XLVIII), in which they are provided with a wide scarious edge.

At the base of the inflorescence there are often conspicuous green bracts, sometimes attaining a considerable length, especially in *Kyllinga*, *Pycreus*, *Cyperus*, *Courtoisia*, *Mariscus*, *Lipocarpha*, *Ascolepis*, and *Schoenus*. These are mentioned here, as in the "leafless" species, e.g. in *Cyperus textilis* Thunb., they form the most important assimilating organs.

INFLORESCENCES.

The unit of the inflorescences in *Cyperaceae* is the so-called spikelet. This is of variable structure, but before dealing with it a few remarks must be made on the terminology employed. Spikelets bear a number of dry membranous leaves, the glumes. A glume may have a flower in its axil. It is then called by me a floral glume. If it has no axillary shoot, it is called an empty glume. In compound inflorescences the ultimate branches of the inflorescence arise in the axils of glumaceous bracts (sometimes suppressed), and may be exactly like floral glumes, e.g. in pseudo-spikelets of *Carex*.

A spikelet is, strictly speaking, a racemose inflorescence, a small spike. Such spikelets are found in all *Scirpeae*, e.g. in *Scirpus*, *Cyperus*, *Fuirena*, etc. The glumes are either distichous or spirally arranged. There are one or two empty glumes (rarely none) at the base of the spikelet, while the others have flowers in their axils (often reduced towards the apex, or even absent). The pure male spikelets of *Carices* have a similar structure. In *Chrysithrix* the spikelet has a terminal female flower, while the male flowers, consisting of one stamen, are in the axils of glumes below it. There are also empty glumes. While racemose inflorescences with terminal flowers are not uncommon, it is not impossible, especially when compared with allied plants, that the so-called "spikelet" in *Chrysithrix* is a cymose structure. In *Schoenoxiphium* we often find (in *Carex* occasionally) that the main axis of the so-called spikelet is distinctly branched, the branch bearing a female flower in the axil of the first floral glume and male flowers in the succeeding ones. Each lateral branch of the so-called spikelet is, therefore, a true spikelet, and the whole of it is a compound spikelet, or *pseudo-spikelet*. Often in *Schoenoxiphium sparteum* (Wahlenb.) Kük and normally in *Carex* the male flowers in these lateral branches are suppressed, and even no trace of the axis bearing them may be developed. The female flowers appear then to arise almost directly from the main axis, surrounded by a more or less closed structure, the utricle. By comparison we see, however, plainly that they represent *reduced spikelets* surrounded by their floral glume. If a " pseudo-spikelet," as is often the case, bears only female flowers, it is really a compound spike (e.g. *Carex cernua* Boott. on Plate LXXX), but often (*Carex zuluensis* C. B. Cl. on Plate LXXIX) the " pseudo-spikelet " bears female flowers in its lower portion and male flowers in the top portion, forming a so-called " androgynous spikelet " of descriptive botany. In this case the " pseudo-spikelet " is compound in the lower portion, simple in the upper, male portion. Palla (Ber. d.d. bot. Gesellschaft, XXIII, 1905, 7) has made it likely that the so-called flowers of *Lipocarpha*, *Ascolepis*, and the old genus *Hemicarpha* Nees (possibly represented in South Africa by *Scirpus isolepis* Boeck.) are in reality reduced spikelets. As a consequence, the view is gaining ground that all lateral cyperaceous flowers are without prophylls, whereas these are a constant feature in *Gramineae*. Structures which most botanists would consider as prophylls, besides occurring in *Lipocarpha*, *Ascolepis*, and *Hemichlaena*, are also occasionally found in *Scirpus membranaceus* Thunb. and *Ficinia ixioides* Nees. Pax (Engl. "Bot. Jahrb.," VII, 1886, p. 290) brought forward the view that the so-called spikelets in many genera of *Cyperaceae* are cymose. He ascribed such a structure still in Engler and Prantl, " Natürliche Pflanzenfamilien," 11, 2, 1887, to the lateral spikelets of *Caricoideae*, but has withdrawn this view in " Pflanzenreich," IV, 20, p. 8. However, in some of the remaining genera, to which he ascribed cymose pseudo-spikelets, his view seems to me to be the only possible one, namely, in the genera which Clarke unites in *Schoeneae*. Here each pseudo-spikelet bears more than two empty glumes at the base, the axis ends in a terminal flower, from the glume preceding it another flower arises which in its turn is terminal, its axis bearing usually only one glume, from which further branching may proceed. This is particularly clear in *Rhynchospora*, *Schoenus*, and some species of *Tetraria*. However, there is nothing startling in it, as both pure cymose and racemose inflorescences occur in other natural orders (e.g. *Liliaceae*, *Amaryllidaceae*, *Iridaceae*) or even in the same genus (e.g. *Cotyledon*), and mixed inflorescences are too common to be illustrated by examples. Palla considers even the spikelets of *Scirpeae* as cymose structures. The flexuous rhachilla frequently occurring in them and the decurrent floral glumes sometimes found, as, e.g., in species of *Mariscus*, lend support to this view. Comparatively rarely the inflorescences are simple spikelets (e.g. occasionally in *Juncellus*, *Cyperus*, *Scirpus* subgen. *Isolepis*, usually in *Ficinia* subgen. *Acrolepis*, in *Scirpus* subgen. *Fluitantes*, *Eleocharis*, *Fimbristylis monostachya*, *Bulbostylis humilis*, etc. More often the spikelets are arranged in more complicated inflorescences, sometimes difficult to analyse, as the bracts of the ultimate branches may be suppressed, accessary branches may be developed, and other complications may be met with.

In *Ficinia trichodes* Benth. and some of its allies the inflorescences are lateral in the upper portion of the stem. In all other cases they are terminal, though often thrown on one side by the lowest of the subtending bracts, which then appears to be a continuation of the stem, e.g. in *Juncellus*, species of *Scirpus*, and *Ficinia*. The subtending bracts are, as stated in the previous paragraph, often leaf-like. This may be the case even in the partial inflorescences of the larger forms, e.g. *Cyperus immensus* C. B. Cl. In some cases they form an involucre, which encloses the inflorescence when young, e.g. in *Scirpus globiceps* C. B. Cl. (Plate XXXIV), *Eleocharis* (Plate XXVI), *Eriophorum* (Plate XLII), *Ficinia radiata* Kunth. (Plate XLIII), *F. striata* Kth. (Plate XLIX), or even more or less permanently, as in some forms of *F. striata* Kth. and *F. ixioides* Nees (Plate XLIV). Paniculate inflorescences are found in *Scirpus spathaceus* Hochst. (Plate XLI), *Schoeneae* (Plates LVIII–LXXI), and the *Cariceae* (Plates LXXIII–LXXX), though sometimes contracted, as in *Schoenus nigricans* L. (Plate LXII). The inflorescence forms a single capitulum in *Kyllinga*, most species of *Ficinia*, most species of *Scirpus*, and in *Ascolepis* (Plate LVII). In most cases they are composed of spikes made up of spikelets. Subumbellate inflorescences composed of sessile or subsessile spikelets occur in *Pycreus*, e.g. *P. umbrosus* Nees (Plate VII), *Cyperus*, e.g. *C. compactus* Lam. (Plate XI), *Scirpus*, *Ficinia*, and *Lipocarpha* (Plate LVI). Subumbellate inflorescences, which, however, bear stalked partial inflorescences, are found in *Courtoisia* (Plate XXV), in *Mariscus* (Plates XXI, XXIII, XXIV), *Cyperus difformis* Linn. (Plate XIII), *Bulbostylis* (Plates XXVII, XXVIII), *Fimbristylis*, *Rhynchospora*, etc. A peculiarity of these inflorescences consists in the fact that usually the rays are uneven, but vary considerably in length in the same species. Thus we find sometimes in *Mariscus congestus* C. B. Cl. very long rays, and in other specimens the partial inflorescences are quite sessile. Simple and compound umbellate inflorescences may also occur in one and the same species, e.g. in *Pycreus flavescens* Reichb. (Plate IV) and *P. Mundtii* Nees (Plate V). Compound spikes arranged in an umbel are found, e.g. in *Mariscus capensis* Schrad. (Plate XX) and *M. sieberianus* Nees (Plate XXII). These inflorescences may be compared to those of *Cyperus longus* L. (Plate XVIII) and other species in which the spikelets are directly seated on the rays of the umbel, though often these branch again before bearing spikelets.

THE FLOWERS.

It is customary to regard the flower of *Cyperaceae* as derived from the ordinary liliaceous type, with two trimerous perianth whorls, two trimerous whorls of stamens, and one of carpels, all whorls in regular alternation. This type is only rarely fully realized, e.g. in the bisexual flowers of *Macrochaetium*. Very frequently the perianth is absent or represented only by one whorl, the androecium is usually only represented by the outer whorl, and may even be further reduced, and the gynaecium is often only represented by two carpels. On the other hand, increase in the number of stamens is found in *Tetraria MacOwani* C. B. Cl., and there are more than three carpels (if the number of style-branches correctly indicates it) in *T. punctoria* C. B. Cl. and *T. Macowani* C. B. Cl. Unisexual flowers are rare in *Scirpeae* (except in the upper parts of the spikelets, in which the flowers are often not developed normally or absent), in *Schoeneae* male flowers are normally associated with bisexual flowers. Unisexual flowers are the invariable rule in the two suborders *Mapanieae* and *Cariceae*.

The Perianth.—Expanded structures which somewhat resemble scale-leaves are found in *Scirpus littoralis* Schrad. and the inner whorl (usually the only one present) in most species of *Fuirena* (Plate LIV), in *Ecklonia* (Plate LXI), sometimes also in *Schoenus* (Plate LXII). As a rule, however, each perianth leaf, where present, is represented by a bristle (generally scabrous), and in *Eriophorum* and *Eriospora* (Plates XLII, LXXV) each is split into a number of hairlike structures. Species with and without perianth are placed in the genera *Scirpus*, *Fuirena*, *Schoenus*, and *Tetraria*. This seems all the more justified, as it may be absent or present in the same species even, e.g. in species of *Scirpus* (see Nos. 36–40 in "Flora Capensis," VII, 212). Moreover, when present they may be very variable. I have discussed this matter more fully under *Fuirena* (p. 50).

The Androeceum.—The filaments grow very rapidly when the pollen is nearly ready to be shed, and are then linear, flattened. The anthers are broadly sublinear or slightly narrowed towards the apex. They have four pollen chambers. At the base they are slightly cordate or, in *Bulbostylis scleropus* C. B. Cl. and species of *Tetraria*, distinctly auriculate. The connective is usually distinctly extended beyond the pollen chambers. The extension is frequently narrow, conical, rarely globular (e.g. *Cyperus sphaerospermus* Schrad.); it is usually covered with short, sharp, conical hairs. The anthers are usually shed when the pollen is discharged.

One-staminate flowers are found in *Scirpus isolepis* Boeck., *Cyperus aristatus* Rottb., the male flowers of *Chrysithrix*, and occasionally in *Cyperus difformis* Linn., *Scirpus hystrix* Thunb., *Sc. macer* Boeck., and also, according to Clarke, in *Kyllinga*, *Pycreus*, *Juncellus*, *Schoenus*, and *Scleria*.

Bistaminate androecea are common in most genera, but generally only as exceptions in normally three-staminate flowers.

The Gynaecium.—The ovary is invariably one-chambered, with a single basal ovule. In *Ficinia* and *Scleria* a disc, frequently ending in three small somewhat fleshy scales, is found at the top of the stalk (compare p. 41). The style is generally well developed, and ends in two, three, four (some species of *Tetraria*), or (in *Tetraria* sect. *Buekia*) six to eight filamentous branches. Very rarely the style is entire or the branches poorly developed (apart from rudimentary gynaecia in male flowers). The base of the style is conspicuously thickened in *Fimbristylis*, *Bulbostylis*, *Rhynchospora*, *Ecklonia*, *Costularia*, many species of *Tetraria*, and *Macrochaetium*, and then remains attached to the nut, except in *Fimbristylis*. The ovary is frequently seated on a small obconical stalk. In *Ficinia* and *Scleria*, amongst South African genera, this gynophore is expanded into a "disc," which is often three-lobed, the lobes generally alternating with the stamens. At present, neither a morphological nor an ecological value can be assigned to this disc. Further reference to it will be found under *Ficinia* (p. 41).

THE FRUIT.

The fruit of *Cyperaceae* is always a nut. The pericarp is usually moderately hard; in *Scleria* it is bony. In this genus it is ovoid or subglobular, but as a rule it is trigonous, the adaxial side being usually broader and flatter than the two others. In the forms with typical dimerous gynaecium, the nut is compressed, dorsally in *Juncellus*, laterally in *Kyllinga* and *Pycreus*. The colour and nature of the surface, though subject to slight variation in individual species, is often of great diagnostic value. It may be smooth, or the surface cells may bulge out, giving rise to various patterns. In some cases the surface becomes pitted, in others the surface layer of cells may disappear (compare Clarke in Journ. Linn. Soc. Bot., XXI, 22–25). When a gynophore is present, this remains attached to the nut as well as the disc in *Ficinia* and *Scleria*. In cases where the base of the style is thickened, the thickened portion (except in *Fimbristylis*) also remains attached. This may give rise to "beaked" nuts, e.g. in some species of *Tetraria* and *Carex*. Lastly, the perianth, when present, usually sticks to the base of the nut or its stalk.

Ecological Notes.

No special attention has yet been given to the ecology of South African *Cyperaceae*, but most interesting results may be expected, especially if tackled in conjunction with anatomical investigations. The valuable paper on *Fuirena oedipus* C. B. Cl., a Rhodesian species, by Miss L. Gibbs in "Ann. of Botany," XXXII, 187, with notes on some other species of this genus, might serve as a guide for an investigation of many of our species. The strictly hydrophilous species will probably be found not to yield many points of general interest that have not been observed in other members of the order from other parts of the world, but we are particularly rich in species which grow in localities that are subject to periodic intense drought. Some of these, such as, e.g., *Cyperus compactus* Lam., species of *Ficinia, Fimbristylis, Bulbostylis, Tetraria,* and *Schoenoxiphium sparteum* (Wahlenb.) Kük., can, when the droughts are not too prolonged, pass through them, developing aerial stems, flowers, and fruits. Others may lie dormant for years, and develop their aerial organs quickly when they have sufficient water at their disposal. Thus, in March, 1920, after good rains, I found on the Koonap heights at the edge of semi-karroid scrub in and around a small pool of water: *Cyperus teneriffae* Poir, *C. difformis* Linn., *Mariscus sieberianus* Nees, and *Scirpus paludicola* Kunth. One may pass this spot for years without suspecting the presence of *Cyperaceae* in that neighbourhood. Again, some species can adapt themselves to very diverse conditions. To quote only one instance: *Mariscus congestus* C. B. Cl. grows generally on mud or damp places along river-courses or stagnant pools; but I found it growing in the sand on the beach at Port St. Johns (in company with *Scaevola thunbergii* E. et Z. and *Ipomaea biloba* Forsk.), and in the veld on a hillside near Pretoria. *Scirpus maritimus* Linn. is found on the mud-flats along our tidal rivers, and a few other species, e.g. *Juncellus laevigatus* C. B. Cl., are tolerant of brackish soil. Some species of *Ficinia* and *Cladium jamaicense* Crantz are often found in sand-dunes by the sea.

Many species are most valuable in so far as they prevent erosion of banks of vleis and rivers, and some should be tested in an attempt to stop erosion. *Cyperus esculentus* Schrad. is a troublesome weed in the coast districts of Natal, and its nearest allies, as well as species of *Mariscus* and others, often give trouble in the coast districts of South Africa.

The methods of vegetative reproduction were mentioned in the chapter on "Vegetative Organs." These should be correlated with the habitat, but unfortunately, in most cases, it is usually indicated by collectors only in the vaguest way, if at all.

In the bisexual flowers of *Cyperaceae,* both proterandry and proterogyny occur. The latter, perhaps, is the most prevalent. The considerable lengthening of the filaments, just before the pollen is discharged, is connected with the almost universal occurrence of wind-pollination. Wettstein mentions (in "Handbuch der System. Bot.," 2nd ed., p. 818) that entomophilous species are also known in the order, but, according to Marloth, even *Ficinia radiata* Kunth., which has a very conspicuous involucre forming a bright, glossy, yellow star at the base of the inflorescence, and *Chrysithrix capensis* L., which has very conspicuous flowers on account of the blue filaments, are anemophilous. He rightly remarks that colour in plant-organs need not necessarily have any special significance.

The difficulties one sometimes finds in assigning specimens of South African *Cyperaceae* to well-characterized species may at all events in some cases be due to hybridization. There are quite a number of hybrids known in members of this order outside South Africa. A specimen collected by Mrs. T. V. Paterson at Walmer (No. 834) looks on the whole like *Mariscus elatior* C. B. Cl., but also bears a number of spikelets which by themselves would have been assigned to a species of *Pycreus.* If this is a hybrid, it will be admitted to be a rather unusual one.

As regards the dispersal of the nuts, no direct observation is available, and one has to fall back on guesswork. The spikelets of *Mariscus* and *Courtoisia*, which drop off almost as a whole, may perhaps be dispersed by the wind. In cases where the perianth remains attached to the nuts, this may help to attach them to passing animals. The nuts of hydrophytic species are no doubt largely dispersed by water and by wading-birds with the mud clinging to their feet. In numerous cases no doubt the nuts are swallowed by birds, and may pass uninjured through their digestive tract. As far as I can see, the disc in *Ficinia* and *Scleria* has no special significance in the dispersal of the nuts, nor can I suggest any other use for it. The germination of not a single endemic South African species has been studied.

Distribution in South Africa, and Relation of the Cyperaceous Flora of South Africa to other Countries.

A NUMBER of details on these points will be found on reference to the notes on the genera. A short summary only will be attempted here, which has to be prefaced by a few general remarks. The arid parts of South Africa are almost devoid of *Cyperaceae*. They are here confined to the rare permanent wet places and to some of the mountain ranges, so that the large bulk of South African species is found in the narrow coast strip from Clanwilliam to Natal, but extending more and more inland in the eastern parts. Many of them occur from sea-level to the highest mountain peaks. A number of them inhabit low altitudes in the south-western parts and higher altitudes farther east, but this is far from being a general rule. Owing to the terrible mismanagement both by natives and Europeans, the veld generally has become drier: numerous vleis and morasses have disappeared; rivers which used to run almost all the year round, and when not running left numerous water-holes, run now only for a short time after heavy rains, and it is therefore safe to say that in former years *Cyperaceae* were more widely spread in South Africa than they are at present.

The hydrophytic species frequently grow gregariously, but those which invade the veld are generally scattered, and nowhere in South Africa do we find these, even on sour pastures, form such a conspicuous element in the composition of the vegetation as, e.g., in the pastures of central and northern Europe.

Endemic Genera are: *Epischoenus*, *Ecklonia*, *Macrochaetium*, *Schoenoxiphium*.

Almost Endemic: Ficinia (a few species in tropical Africa), *Tetraria* (one species in Australia), *Chrysithrix* (one species in Australia). The two first and *Chrysithrix* are only found in the south-west, and both *Ficinia* and *Tetraria* also have their headquarters there.

Schoenus is mainly Australian, and *Carpha* is found only in the southern hemisphere. Relations with the flora of Australia are also found in some species of *Scirpus*, *Lipocarpha*, *Costularia*, and *Cyperus tenellus* Linn. f. In many cases of such relations, they are strongest with plants from the south-west corner of South Africa. Clarke's paper on the southern origin of *Schoeneae* should be consulted in this connection.

Genera closely associated with Tropical Africa (though mostly of much wider distribution in tropical and warm–temperate climates; very frequently close relations with the Mascarene Islands can be traced): *Kyllinga*, *Pycreus*, *Juncellus*, *Cyperus*, *Courtoisia*, *Mariscus*, *Fimbristylis*, *Bulbostylis*, *Fuirena*, *Lipocarpha*, *Ascolepis*, *Scleria*, *Eriospora*. The four last are only eastern and north-eastern in South Africa. Almost all these genera have endemic species in South Africa.

Cosmopolitan Genera (all with cosmopolitan species in South Africa): *Eleocharis, Scirpus, Rhynchospora, Cladium, Carex.* In *Scirpus* there are numerous endemic species, and there are also endemic species in *Eleocharis*, *Rhynchospora*, and *Carex.*

Northern Temperate and Arctic: *Eriophorum* (only once found in the Transvaal).

These facts are of great interest in speculations on the evolutionary history and migrations of *Cyperaceae*, but such speculations could only be profitably dealt with by taking into consideration all genera and species of the order to a thorough knowledge of which outside South Africa I cannot make any claim, but I should like to emphasize here :—

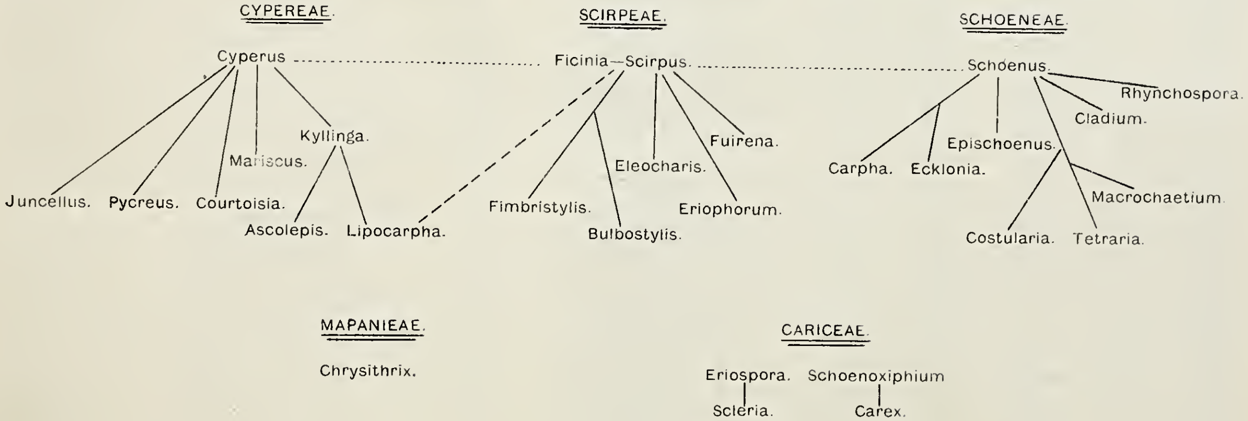
(1) The general liliaceous floral diagram is fully realized in *Macrochaetium*, and frequently in *Tetraria* sect. *Eu-Tetraria*, both confined to South Africa. These may be close to the original stock of *Cyperaceae.*

(2) Our almost endemic genus *Schoenoxiphium*, as circumscribed by Kükenthal, is looked upon by that eminent authority as the starting point of the group of genera of which *Carex* is the most important member.

Relations of South African Genera to One Another.

The following scheme, which is meant to explain these relations, requires no explanation if taken in conjunction with the subsequent remarks on the genera and the species represented on our illustrations. It is based largely on floral structure, but, e.g., *Ficinia* subgen. *Hemichlaena* approaches *Cyperus* in its spikelets, and this has been indicated by connecting them by means of a dotted line.

RELATIONSHIP OF S.A. GENERA OF CYPERACEAE.



Notes on South African Genera and Selected Species.

KYLLINGA Rottb. (*Kyllingia* Auct.).

This genus is easily recognized by the capitate inflorescence at the base of which there are one to seven foliaceous bracts; the only South African plant which is often confused with it, when not carefully examined, is *Ascolepis capensis* Ridl. The spikelets have in most species only one flower perfecting a nut, which is laterally compressed. The style has two branches. The rhachilla in fruit becomes detached below the lowest fertile flower.

The genus has about forty-five species found in all warm countries, but by far the largest number of them are found in Africa (thirty-eight in tropical Africa).

Of the ten species, recognized by Clarke in the "Flora Capensis," VII, 151, *K. Lehmanni* Nees and *K. Buchanani* C. B. Cl. may have to be sunk in *K. alba* Nees. In any case it is misleading to place them into two different sections of the genus. Of the ten species recorded in the "Flora Capensis," VII, no less than seven occur also in tropical Africa. The three endemic species are all eastern.

Plate I (Burchell 1997).

Kyllinga alba Nees, var. *alata* C. B. Cl.

"Flora Capensis," VII, 151; "Flora of Trop. Afr.," VIII, 272.

A.—Plant, natural size.
B.—Flowering head, twice natural size.
C.—Spikelet, magnified six times.
D.—Floral glume, magnified six times.
E.—Young flower, magnified ten times.

The spikelet figured contained one lower perfect and one upper rudimentary flower.

South African Specimens Examined.—(*a*) *typica.*—Muskett, Hopetown; Moran 64, Kimberley; Stent 9962, Armoedsvlakte, Vryburg; Rogers 5654, Mochudi; Potts 1673, Bloemfontein; numerous Transvaal specimens from Pretoria, Nylstroom, Christiana, etc, (*β*) *alata.*—Zeyher 4367, Zwartkops River; Paterson 259, Redhouse; Bennie 354, below brick kilns, Grahamstown; MacOwan 727, sandy soil near Kasouga Mouth; Bolus, Roundhill, Bathurst District; Potts 226, Port Alfred; Lewis 49, Southernwood, East London; F. Bolus 272, in moist ground on mountain tops, Aliwal North, 4900 ft.; Schonland 3884, Libode, Pondoland (also at Port St. Johns); Dieterlen 6997 (pr. pte.), Leribe; Wood 808, 4014, Durban; Schlechter 2949, Claremont, Natal; Burchell 1997, Griqualand West; Burtt-Davy 15102, Vereeniging; Moss and Rogers, 946, Pietersburg.

Distribution.—The type of this species has its western limit near Queenstown and becomes common towards the tropics. It is widely spread in tropical Africa. The variety *alata* is found as far west as the neighbourhood of Port Elizabeth, is also common in eastern South Africa, but only extends to south-west tropical Africa.

Remarks.—*K. Lehmanni* Nees should be associated with *K. alba*. Of the plants quoted by Clarke in "Flora Capensis," VII, 155, I have seen Baur 274, Flanagan 727 (named *K. Lehmanni* by Clarke in Herb. Bol.), and Ecklon and Zeyher's specimens named *K. Lehmanni* Nees, which came from Jagersdrift, Alexandria Division. The following are exactly like them: MacOwan 476, Bothashill, near Grahamstown; Hilner 378, amongst grass eleven miles west of East London. In Flanagan 727 just referred to, each spikelet had a bisexual and above it a male flower. Stamens and gynaecium are exactly as in *K. alata*. The glumes are glabrous, except for a few minute bristles at the point of the produced keel. There was no sign of a wing on the keel, but this, as Clarke points out, appears late in *K. alba*. It may be added that I have seen two well-developed bisexual flowers in a spikelet of typical *K. alba*.

Plate II (MacOwan 1351).

Kyllinga erecta Schum.

" Flora Capensis," VII, 152 ; " Flora of Trop. Afr.," VIII, 274.

A.—Plant, natural size.

B.—Spikelet, magnified eight times.

C.—Fertile glume, magnified eight times.

D.—Young flower, magnified eight times.

The spikelet figured had only one flower, the lower glume normally bearing a flower in its axil was " sterile."

South African Specimens Examined.—Schlechter 1989, Riversdale ; Paterson 2200, Redhouse ; E. and Z., Uitenhage ; Daly 916, Grahamstown ; Daly and Sole 42 and 202, MacOwan 1351, Britten 943, Grahamstown (MacOwan 1351 is quoted by Clarke in " Flora Cap.," VII, p. 154, under *K. pulchella*) ; Daly 661, Trapp's Valley ; Hilner 138, Kingwilliamstown ; Hilner 367, Toise River ; Galpin 7355, Hilner 214, East London ; Flanagan 917, Komgha (*K. melanosperma* has been distributed by Flanagan under the same number) ; Pegler 1480, Kentani ; Wood 1076, Verulam ; Drege, Queenstown ; Bolus 8288, Flanagan 2057, Bester's Vley, near Witzie's Hoek, O.F.S. ; Dieterlen 6596, 6998, Leribe ; Burtt-Davy 15051, Vereeniging ; Burtt-Davy 17390, Ermelo Pass ; Rehmann 5350, Klippan, Transvaal, Bushveld.

Distribution.—Very widely spread in tropical Africa and the Mascarene Islands. In South Africa it is fairly common in the south-eastern coast districts, inland to the Transvaal, and the Drakensbergen westwards to Riversdale. Range of altitude in South Africa : from near sea-level to nearly 6,000 ft.

Remarks.—This species can generally be easily recognized, because its head often has a golden tinge. The rhizome is creeping as a rule, but occasionally (perhaps young ?) tufts are found in which it is short and the culms crowded. This is e.g. the case in some specimens distributed by Flanagan under No. 2057. I do not think they are specifically distinct from *K. erecta*, although some exhibit the unusual character that the leaf blades are only about $\frac{3}{4}$ inch long, while others have well-developed blades. Clarke states that the " leaves are often half the length of the stem." They vary considerably. In some of the specimens quoted above they are as long as the stem, in others even slightly longer.

Plate III (Mogg 5702).

Kyllinga melanosperma Nees.

" Flora Capensis," VII, 153 ; " Flora of Trop. Afr.," VIII, 277.

A.—Plant, natural size.

B.—Flowering head, twice natural size.

C.—Spikelet, magnified seven times.

D.—Floral glume, magnified seven times.

E.—Young flower, magnified.

The spikelet had two flowers, the lower bisexual, the upper male.

South African Specimens Examined.—MacOwan 673, Grahamstown ; Hilner 126, Kingwilliamstown ; Flanagan 1779, East London ; Flanagan 917, Komgha ; Pegler 240, Kentani ; Tyson 2864, 2865, Clydesdale ; Wood 8641, Greytown ; Mogg 5702, 5706, Dargle Road ; Mogg 6460, Sevenoaks, Natal ; Mogg 5895, 6079, 6178, Zululand ; Bolus 9785, Barberton ; Pott 5226, Maviriestad.

Distribution.—Tropical Africa (both east and west), Mascarene Islands, India, and Malaya. In South Africa it is found in the south-east coast districts to a short distance beyond Grahamstown, but it is also recorded from the Transvaal and Graaff-Reinet. The lowest altitude recorded is 157 ft. (Zululand), the highest 3650 ft. (Sevenoaks, Natal).

Remarks.—I am afraid Clarke (in " Flor. Cap.," VII) has not clearly distinguished this species from *K. elatior* Kunth. The latter is described by Kunth (Enum. II, p. 135) as " creeping." Boeckeler (Linnaea, XXXV, p. 422) says of it, " rhizomate pennam gallinaceam circ. crasso vaginis lanceolatis hyalino-marginatis laxe vestito, culmis distantibus." In *K. melanosperma*, on the other hand, the rhizome is comparatively thick, and the culms are crowded as shown in our figure A. This character, taken in conjunction with others mentioned by Clarke, separates the two species quite sharply.

PYCREUS Beauv.

This genus is frequently made a subgenus of *Cyperus* L. Its dimerous gynaecium alone separates it from this genus, while its laterally compressed nut separates it from *Juncellus* C. B. Cl. In *Cyperus semitrifidus* Schrad. we find, however, a transition between *Pycreus* and *Cyperus*, as the style-branches may here be two, three, or nil; in the first case a dimerous gynaecium is indicated. Two-branched styles also occur occasionally in other species of *Cyperus*, e.g. *C. textilis*, *C. longus*, etc. Many species of *Cyperus*, such as, e.g., *C. rupestris*, *C. teneriffae*, *C. usitatus* and its allies, have the same general habit as many species of *Pycreus*.

There are over sixty species in all tropical and warm–temperate regions, a few extending to Canada and Queensland. Some species cover nearly the whole area of the genus. Thirteen South African species are recognized by Clarke in the " Flora Capensis," VII, two of which are not known from tropical Africa (*P. Cooperi* C. B. Cl. and *P. chrysanthus* C. B. Cl.). All South African species favour wet localities.

PLATE IV (Mogg 596).

Pycreus flavescens Reichb.

" Flora Capensis," VII, 156; " Flora of Trop. Africa," VIII, 290.

A.—Plant, half natural size.
B.—Spikelet, twice natural size.
C.—Floral glume, eight times natural size.
D.—Young flower, ten times natural size.
E.—Nut, twelve times natural size.

South African Specimens Examined.—Pegler 1089, in marshes near Kentani; Dieterlen 6606, Leribe; Buchanan 110, Orange Free State; Potts 603, Parys, Orange Free State; Wilms 1634, Lydenburg (var. *abyssinicus* Steud.).

Distribution.—From England and Denmark to Cabul and the Cape; in America from Canada to South Brazil. In South Africa it is found here and there in the Transvaal, Orange Free State, and on the Drakensbergen, but descends to 1000 feet at Kentani.

PLATE V (Schlechter 2553).

Pycreus mundtii Nees.

" Flora Capensis," VII, 157; " Flora of Trop. Africa," VIII, 294.

A.—Plant, natural size.
B.—Floral glume, magnified six times.
C.—Young flower, magnified ten times.

South African Specimens Examined.—Wolley Dod 3534, 3538, Cape Peninsula; Mundt, Swellendam; Schlechter 2553, Uitenhage, 250 ft.; Dieterlen 4814, Leribe; Flanagan 2062, Besters Vlei, near Witzies Hoek, Orange Free State, 5500 ft.; Wood 4016, near Pinetown; Rehmann 7736, Camperdown; Mogg 6223, 6083, Zululand; Potts 615, Parys, Orange Free State; Schlechter 3699, Mundt's Farm, near Pretoria; Rogers (without number), Waterval Boven.

Distribution.—Common throughout tropical Africa, the Mascarene Islands, and Spain. In South Africa it is found disjointedly in the coast districts from

Capetown to Natal, and in the east extends inland to the Orange Free State and the Transvaal. Its altitude ranges from 250 feet to over 5000 feet, the higher altitudes being reached in the eastern parts.

Remarks.—This species is easily distinguished from other South African species by its elongated ascending rhizome and leafy stem.

PLATE VI (Mogg 6037).

Pycreus polystachyus Beauv.

" Flora Capensis," VII, 157 ; " Flora of Trop. Africa," VIII, 296.

A.— ⎫ Plant, natural size.
B.— ⎭
C.—Floral glume, magnified eight times.
D.—Young flower, magnified ten times.

South African Specimens Examined.—Wolley Dod 3202, roadside beyond Camp Ground, Wynberg ; Wolley Dod 3555, shore beyond Sea Point ; Bolus 3309, on the margins of rivers in the Cape dunes ; Burchell 7567, Zoutemelks Valley, Caledon Division ; Schlechter 1991, near Riversdale ; Zeyher 4358, Zwartkops River ; Schönland 3187, on mud near Zuurberg Sanatorium ; MacOwan 659, Daly 32, Britten 974, 928, in damp ground on the hills south of Grahamstown ; Hilner 151, about eleven miles west of East London, near sea-level ; Flanagan 959, marshy spots near Kei mouth, 100 ft. ; Pegler 350, marsh near Kentani ; Rehmann 8606, Durban ; Krauss 189, Port Natal ; Buchanan 129, Natal ; Bews 11, vlei, Amanzimtoti ; Schlechter 6789, Howick ; Mogg 6027, Zululand ; Moss and Rogers 454, The Downs, Pietersburg Division.

Distribution.—In tropical and warm temperate climates throughout the world. In South Africa it is found in the coast districts (except the arid west), but does not go far inland.

Remarks.—Clarke indicates in the " Flora Capensis," VII, 158, that the var. *laxiflora* Benth. is not sharply divided from the type.

The following (mentioned above) may be referred to it : Rehmann 8606, Schlechter 6789 (with very long spikelets), Krauss 189, Buchanan 129.

This species sometimes develops a rhizome.

PLATE VII (Mogg 6252).

Pycreus umbrosus Nees.

" Flora Capensis," VII, 158 ; " Flora of Trop. Africa," VIII, 303.

A.—Plant, natural size.
B.—Spike, twice natural size.
C.—Floral glume, magnified four times.
D.—Flower, magnified four times.

South African Specimens Examined.—Ecklon and Zeyher, Clanwilliam ; Bolus 4231, in wet places, Grabouw, near Palmiet River ; Wolley Dod 3546, orchard below Kirstenbosch ; Wolley Dod 2017, meadow below Klein Konstantie ; MacOwan, Herb. Austr. Afr. 1797, dunes near Princes Vley ; Schlechter 1117, Sir Lowrys Pass, 400 ft. ; MacOwan 2053, Vanstadens River, 50 ft. ; Zeyher 4357, Zwartkops River ; Holland 93, near Zuurberg Sanatorium ; MacOwan, Boschberg ; Schönland 209, Fort England, Grahamstown ; Sim 2852, Kingwilliamstown ; Pegler 1136, Kentani, 1000 ft. ; Tyson 1681, Kokstad, 5000 ft. ; Tyson 1614, Matatiele ; Bews 12, Nottingham Road ; Mogg 6513, Balgowan, Natal, 4350 ft. ; Mogg 5732, Dargle Road, Natal ; Mogg 6459, Sevenoaks, Natal ; Mogg 6252, Melmoth, Zululand, 2700 ft. ; Bolus 8281, between Besters Vlei and Bethlehem, Orange Free State ; Flanagan 2080, Besters Vlei, near Witzies Hoek, Orange Free State, 5500 ft. ; Theiler, Onderstepoort ; Bolus 9791, high veld near Middelburg, Transvaal ; Rogers 11554, Carolina ; Burtt-Davy 17402, Ermelo.

Distribution.—Tropical Africa (including Zanzibar), Madagascar, and South Africa. In South Africa it is found mostly in a narrow coast belt from

Clanwilliam to Zululand. Only in the east is it found far inland (Orange Free State and Transvaal). In the south-west it descends to nearly sea-level; in the east it rises to an altitude of nearly 6000 feet.

Remarks.—The species is frequently stoloniferous, and is, therefore, only distinguished from *P. betschuanus* (Boeck.) C. B. Cl. by its larger, relatively broader, and more compressed spikelets, rather unsafe characters for specific distinctions.

Plate VIII (Flanagan 958).

Pycreus angulatus Nees.

"Flora Capensis," VII, 160; "Flora of Trop. Africa," VIII, 305).

A.—Plant, half natural size.
B.—Spike, natural size.
C.—Floral glume, four times natural size.
D.—Young flower, six times natural size.
E.—Nut, six times natural size. (It has a slightly rough surface.)

South African Specimens Examined.—Flanagan 958, marshy spots near Kei mouth; Drege, Klipplaat River, Queenstown Division, 3500 ft.; Baur 371, Bazija; Mogg 18702, Kokstad; Dieterlen 1320, Mafeteng; Burtt-Davy 13000, Bloemhof District; Schlechter 3702, near Pretoria.

Distribution.—Widely distributed in all tropical and warm-temperate countries, but rare in tropical Africa. In South Africa it is found in the south-eastern parts, but it is not recorded from Natal. Its altitude ranges from near sea-level to over 5000 feet.

Remarks.—I have not seen a type of *P. chrysanthus* C. B. Cl. I doubt, however, whether it can be kept distinct from *P. angulatus*.

JUNCELLUS C. B. Cl.

Differs from *Cyperus* only in having the style two-fid, not three-fid, and from *Pycreus* in having the nut dorsally compressed. It is often, and rightly, treated as a subgenus of *Cyperus*. In fact, in the "Flora of Tropical Africa," VIII, 310, Clarke himself says of *J. minutus*: "This plant is possibly a *Cyperus*. It is in the case of very small reduced species that generic characters elude us; *Cyperus tenellus* and *Schoenus nitens* have been treated as *Scirpus*."

There are twelve species, scattered in nearly all warm and temperate regions, but only one is recognized in South Africa.

Plate IX (Pegler 1494).

Juncellus laevigatus C. B. Cl.

"Flora Capensis," VII, 161; "Flora of Trop. Africa," VIII, 308.

A.—Plant, natural size.
B.—Spikelet, twice natural size.
C.—Floral glume, magnified twenty times.
D.—Nut, magnified twenty times.

South African Specimens Examined.—Galpin and Pearson 7392, mouth of River Swakop; Pearson 3380, banks of Swakop River and sand-dunes, Walfish Bay; Pearson 4916, Benkesfontein; Schlechter 13, Henkries, Bushmanland; Pearson 2290, in crevices near top of Rattel Poort Mountains, Little Namaqualand (scapes up to 15 inches long); Drege, Uitvlugt, between Leeuwenfontein, Brakwater, and Buffelsriver, 3-4000 ft.; Zeyher 4363, near Cape Recief; J. L. Drege 646, Port Elizabeth; Britten 1917, Saltvlei, Port Alfred, in water; Rattray 1273, moist sandy shores, East London; Pegler 1494, on beach in sea-water, Kentani; Wood 1365, 11656, Durban flats; Wood 4007, near Umgeni mouth; Bolus 9792, sandy soil, Lourenzo Marques; MacOwan 1682, Biesjesfontein, Somerset East Division; Tyson 579, Murraysburg; Bolus 715, moist places on river bank, Graaff-Reinet, 2500 ft. (scapes nearly 2 inches long); Potts 311, Parys, Orange Free State; and a number of others from the South-West Protectorate.

Distribution.—In all warm and temperate regions. In South Africa, though not absent from any of the main regions, its distribution is somewhat disjointed. It seems to be absent from the Transvaal, Bechuanaland, and the Karroo (except the mountainous parts). Its altitude ranges from sea-level to about 4000 ft.

Remarks.—This species varies considerably in its vegetative organs, the size and number of the spikelets. A close examination of a larger series of specimens may lead to the conclusion that it should be split into several species.

CYPERUS L.

There are about 300 species found in all warm and temperate regions. In the "Flora Capensis" Clarke records forty species. To this number probably about ten have to be added when the material available is thoroughly worked out. *C. Schlechteri* C. B. Cl. (Schlechter 6447, Insiswa mtn.) and *C. zollingeroides* C. B. Cl. (Rust 367 p. pte., Riversdale) were described in Kew Bull. VIII (1908), 3, 10. Of the forty, no less than twenty-six have also been recorded from tropical Africa. It is interesting to note the relationships of the remaining fourteen. In the subgenus *Choristachys* only one of thirteen species is endemic, namely, *C. fastigiatus*, which is closely allied to tropical African species. In the subgenus *Pycnostachys*, *C. prasinus* is very close to *C. albostriatus*, *C. leptocladus* is close to Mascarene species, *C. subchoristachys* is close to the ubiquitous *C. diffusus*. *C. haematocephalus* and *C. pulcher* are close to the widely spread *C. difformis*; *C. bellus* and *C. fuscescens* (the latter unknown to me, but evidently very close to *C. bellus*) seem to be allied to *C. tenax*, which is widely spread in tropical Africa. So far, the relationship with the tropical African flora is overwhelming, but the case is different when we come to the first four species. These appear to be almost restricted to south-west Cape Province. (No locality is mentioned in the "Flora Capensis" for *C. leucoloma*, but Zeyher 4370, from damp, sandy places on the Cape Flats, is evidently this species. I have not come across *C. Meyerianus*, of which no locality is mentioned either.) *C. tenellus* occurs also in New Zealand and temperate Australia; the others are endemic. As so many other south-western types have affinities with Australasia, the distribution of *C. tenellus* is noteworthy. Most species are decidedly perennial, but a few are stated to be annuals. In *C. bellus* this is certainly not the case, while in such delicate plants as *C. tenellus*, which grow on mud or in water, and which, though not forming a distinct rhizome, reproduce themselves vegetatively as long as the conditions suitable for their growth are present, no sharp line can be drawn between annuals and perennials. If the water dries up they die, and if this occurs in any one locality every year, they are annuals; otherwise they perennate. The majority of the species are decided hydrophytes, or at all events favour damp localities, but a number of them can persist by means of their rhizomes for years in time of drought; few grow away from running or standing water.

C. usitatus and details of *C. compactus* (= *C. obtusiflorus* Vahl), and of *C. textilis* were figured by Marloth in "Flora of South Africa," IV, t. 9.

Plate X. (Hilner 255).

Cyperus tenellus L.f.

"Flora Capensis," VII, 165.

A.—Plant, natural size (the stems should have been drawn a trifle thinner).
B.—Floral glume, magnified eight times.
C.—Gynaecium, magnified twelve times.
D.—Stamen, magnified twelve times.
E.—Nut, magnified twelve times.

South African Specimens Examined.—MacOwan, sandy places, Cape Flats; Zeyher 4365, *ibid* (?); Bolus 7929, Kenilworth; Wolley Dod 3390, Park Road, by Camp Ground; Wolley Dod 3721, Hex River Valley; Burchell 6703, Zoutmelk's River, Riversdale; Bolus 2690, Vlugt, Knysna; Schönland 3579, Knysna Heads, West; MacOwan 2175, Vanstadensberg; Zeyher, Zwartkops River; MacOwan 1903, Schönland 582, Hilner 255, near Grahamstown (where it is common in sandy places along rivulets); MacOwan 2103, Boschberg; Rattray 392, Hogsback Marshes. Var. *micromegas* (Nees): Ecklon and Zeyher, Clanwilliam; MacOwan in Herb. Austr. Afr. 1897, Mowbray; Pappe, Tulbagh.

Distribution.—Temperate Australia and New Zealand, and south-west Cape Province to Grahamstown, the Boschberg and Hogsback. Range of altitude, from near sea-level to about 5000 ft.

Remarks.—This species is somewhat variable in a number of characters. Thus the glumes, though usually obtuse, may be subacute. The width of their membranous edges, the size of the plants generally, and of the spikelets in particular, are not constant. The nut in one and the same specimen of undoubted *C. tenellus* varies in shape. It may be exactly as in *C. micromegas* Nees, and as this species is chiefly distinguished by the size of the spikelet, which again may vary on the same tuft, I have sunk it in *tenellus* as a *variety.* The variety *gracilis* (Nees), kept up by Clarke, can only be looked upon as a growth-form of *tenellus.*

Plate XI (Mogg 6634).

Cyperus compactus Lam. var. *flavissimus* (Schrad.) C. B. Cl.

"Flora Capensis," VII, 168; "Flora of Trop. Africa," VIII, 319.

A.—Plant, natural size.
B.—Floral glume, magnified three times.
C.—Flower, magnified five times.
D.—Nut, magnified ten times.

South African Specimens Examined.—(*a*) *typicus*: Flanagan 996, pastures near Keimouth, 300 ft.; Schlechter 3057, Clairmont, Natal, 50 ft.; Rogers 526, Port Shepstone. (*β*) *flavissimus*: Ecklon and Zeyher, Clanwilliam; MacOwan 1205, top of Boschberg and Grahamstown; Galpin 166 and Schönland 221, Grahamstown (on grassy slopes); Schönland 3326, Southwell, on dry pastures; Zeyher 4362, Zwartehoogde; Scully 156, Stockenstrom; Cotterell 93, Cathcart; Sim 1387, Mount Coke; Rattray 814, East London; Baur 1170, Indwe; Baur 280, Bazija; Schönland 4139, between Qumbu and Shawbury, 3600 ft.; Tyson 1130, 1471, Kokstad (also in Herb. Austr. Afr. 1236); Wood 567, near Durban, 120 ft.; Hutton 189, 222, Shafton, Howick, Natal; Schlechter 3385, Ladysmith; Mogg 17849, Rosetta, Natal; Mogg 6634, Maritzburg; Mogg 6874, Dargle Road; Flanagan 2056, Bolus 18287, Besters Vlei, near Witzies Hoek, Orange Free State; Cooper 918, Orange Free State; Dieterlen, Leribe, 5–6000 ft.; Burtt-Davy 15101, Vereeniging; Leendertz 489, Pretoria; Rogers 11587, Burtt-Davy 2863, Swaziland; Beeton 115, Wakkerstroom; Bolus, Houtbosch, 5600 ft.

Distribution.—Widely spread in tropical Africa. In South Africa it is very common in the south-eastern and eastern grass veld, both in damp places and in very dry pastures, thriving even during severe droughts. It is absent in all other regions, except for a record by Ecklon and Zeyher at Clanwilliam. It favours altitudes of 2–3000 ft.

Remarks.—Both in the "Fl. Cap.," VII, 168, and "Flora of Trop. Afr.," Clarke has dealt with the variations of the spikelet of this species.

PLATE XII (MacOwan 1505).

Cyperus semitrifidus Schrad.

"Flora Capensis," VII, 170.

A.—Plant, natural size.
B.—Floral glume, magnified six times.
C.—Gynaecium (with undivided style) with one of three stamens, magnified six times.
D.—Gynaecium with trifid style.
E.—Nut, magnified six times.

Specimens Examined.—J. L. Drege 392, Port Elizabeth; Schlechter 2513, Uitenhage, 250 ft.; MacOwan 1505, foot of Boschberg and Bothas Hill, near Grahamstown; Paterson, Highlands, near Grahamstown; Daly 683, Trapps Valley, 1000 ft. (style bifid); Flanagan 1015, amongst rocks near Komgha; Dieterlen 595*b*, Leribe (style undivided, or with two minute style-branches); Burtt-Davy 922, Standerton; Theiler, Onderstepoort; Rogers 2572, Witbank.

Distribution.—Scattered in the north-eastern and eastern parts of South Africa, usually on sandy soil, rising in altitude eastwards.

PLATE XIII (MacOwan 1347).

Cyperus difformis L.

"Flora Capensis," VII, 170; "Flora of Trop. Africa," VIII, 330.

A.—Plant, natural size.
B.—Spikelet in fruit, after some of the glumes and nuts have been shed, five times natural size.
C.—Floral glume, magnified ten times.
D.—Nut, magnified ten times.

South African Specimens Examined.—MacOwan, Vanstadensberg; MacOwan, 1347, Somerset East; MacOwan 1347, damp places, Grahamstown; Flanagan 1262, marshy spots near Komgha; Dieterlen 775, Leribe; Schlechter 2902, Phoenix, near Verulam, Natal, 100 ft.; Potts 607, Parys; Burtt-Davy 17495, Vereeniging; Mogg 3695, Kaalfontein, Transvaal.

Distribution.—This species grows in swampy places in all warm and warm-temperate regions of the Old World, and extending through Polynesia to the Phillippine Islands. In South Africa it is not recorded west of Vanstadens.

PLATE XIV [Hilner 74 (dissections), Paterson 253].

Cyperus textilis Thunb.

"Flora Capensis," VII, 174; Marloth, "Das Kapland," fig. 15; and "Flora of S. Africa," IV, fig. 7b.

A.—Plant, half natural size.
B.—Spikelet, magnified three times.
C.—Floral glume, magnified ten times.
D.—Stamen, magnified ten times.
E.—Gynaecium, magnified ten times.

Specimens Examined.—Schlechter 1967, Riversdale, 300 ft.; Zeyher 4353, Zwartkops River; Paterson 253, Redhouse; Kemsley 244, Port Elizabeth; MacOwan, Somerset East, 2300 ft.; Glass 743, Coldspring, near Grahamstown; Hilner 74, Blaauwkrantz, near Grahamstown; Britten 732, east of Port Alfred; Galpin 3119 and Rattray 864, near East London; Flanagan 1004, Komgha; Hilner 328, Bowkers Park, near Queenstown, 3500 ft.; Pegler 1152, Kentani, 1000 ft.; Schlechter 3017, Avoca, Natal, 200 ft.

Distribution.—In the coast districts of South Africa, from Clanwilliam to Natal. At either end it seems to be much more scattered than, e.g., near Grahams town, where it is very common. Clarke states (" Fl. Cap.," VII, 175) that it has also been collected in Algiers, is a colonist at Bordeaux, and cultivated in Mauritius. It is always found gregarious in boggy places and along river banks.

Remarks.—Some of the flowers in Kemsley 244 had two-branched styles. In Rattray 864 the spikelets are longer than usual.

PLATE XV (Pegler 1084).

Cyperus albostriatus Schrad.

" Flora Capensis," VII, 176.

A.—Plant, natural size.
B.—Floral glume, magnified twelve times.
C.—Young stamen, magnified twelve times.
D.—Gynaecium, magnified twelve times.
E.—Top of stamen, more highly magnified.

Specimens Examined.—Paterson 549, Port Elizabeth Valley ; Zeyher, in shady places, Uitenhage ; Schlechter 2519, Uitenhage ; Holland 140, Zuurberg ; Rogers 162, Somerset East ; MacOwan 1690, shady places at the foot of the Boschberg ; Schönland, in shady places near Grahamstown ; Daly 703, Trapps Valley ; Hutton 60, Port Alfred ; Schönland 4332, Katberg ; Flanagan 986, Komgha ; Pegler 1084, waste land, Kentani ; Schönland 4173 and Flanagan 2513, damp places, edge of forest, Port St. Johns ; Schönland 4117, grassy slopes between Qumbu and Shawbury ; Tyson 2546, Umzimkulu, 5000 ft. ; Wood 749, Durban Flats ; Wood 1088, Inanda ; Rogers, 1461, Durban ; Bews 9, Amanzimtoti, sand-dunes ; Bews 10, Adams Mission Station, 600 ft. ; Mogg 6676, Lidgetton ; Mogg 6120 Melmoth, Zululand, 2900 ft. ; McCallum, Pietersburg.

Distribution.—The species is almost restricted to Bolus's south-east coast region, growing from near sea-level to an altitude of 5000 feet (in Griqualand East). It favours damp shady places at the edges of forest.

PLATE XVI (Rogers 3219, Mogg 6082).

Cyperus distans L.f.

" Flora Capensis," VII, 178 ; " Flora of Trop. Africa," VIII, 349.

A.—Plant, half natural size.
B.—Condensed inflorescence of Mogg 6082, half natural size.
C.—Floral glume, magnified nine times.
D.—Gynaecium, magnified nine times.

South African Specimens Examined.—Rogers 3219, Kei Road ; Flanagan 1264, grassy valleys near Komgha, 2000 ft. ; Pegler 1084, marshes, Kentani, 1000 ft. ; Schönland 4230, 4240, common in damp shady places, Port St. Johns ; Mogg 597, 6780, Tweedie, Natal, 3630 ft. ; Bews 5, Maritzburg ; Mogg 1244, Mooi River ; Mogg 6082, Melmoth, Zululand ; (?) Schlechter 3933, Lydenburg, 4800 ft. (flowers too young for accurate determination) ; McCallum, Pietersburg, in white sandy soil, 4300 ft., not common.

Distribution.—In all warm and warm-temperate countries. In South Africa it has not been found west of Kei Road.

Remarks.—I have never seen the stolons which this plant is said to form sometimes.

PLATE XVII (Daly and Sole, 176).

Cyperus usitatus Burch.

" Flora Capensis," VII, 179.

A.—Plant, natural size.
B.—Floral glume, magnified six times.
C.—Stamen, magnified six times.
D.—Gynaecium, magnified six times.

Specimens Examined.—(?) Schlechter 10675, on hills near Saron, 600 ft. ; (?) Schlechter 1425, near Tulbagh Waterfall, 500 ft. ; Schlechter 2500, near Uitenhage, 400 ft. ; Paterson

492, 619, Redhouse; Veitch, Coega; Daly and Sole 176, Grahamstown; Hutton 42, Port Alfred; Flanagan 1015, Komgha; MacOwan, Somerset East; Galpin 1697, grassy plains, Katberg, above 5000 ft. and ditches, Queenstown; Rattray 210, Hogsback; Rattray 68, Gaikas Kop, 6000 ft.; Hepburn 154, 208, Majuba Nek, Sterkspruit, Herschel District; Dieterlen 524, 913, Leribe; Flanagan 1873, Besters Vlei, near Witzies Hoek, 5500 ft.; Galpin 6872, valley above Buffalo River Waterfall, Basutoland, about 8200 ft.; Bolus 149, Banger Farm, Middelburg District, Cape, 4000 ft.; Burchell 2684, Hopetown Division; Adams 223 Warrenton; Zeyher 1743, Commissiedrift, near Caledon River; Mogg 1120, Onderstepoort.

Distribution.—In temperate South Africa, extending to Amboland and Hereroland. It seems to be very rare in the south-west coast region, and to be absent from Natal, but penetrates into the arid central parts. It occurs from near sea-level to an altitude of over 8000 ft. The specimens which I have seen from above 6000 ft. (Rattray 68, 210, and Galpin 6872) are dwarfed considerably.

Remarks.—This species favours damp localities, but often becomes a troublesome weed in gardens and especially nurseries. It can be eradicated by pigs being let loose, or by covering the ground with certain grasses, Kikuyu grass especially being very effective.

PLATE XVIII (Zeyher, Clanwilliam).

Cyperus longus L., var. *tenuiflorus* Boeck.

"Flora Capensis," VII. 182; "Flora of Trop. Africa," VIII, 358.

A.—Plant, half natural size.

B.—Floral glume, magnified ten times.

C.—Gynaecium, with one of the three stamens, magnified ten times.

South African Specimens Examined.—Zeyher, Brakfontein, Clanwilliam; Wolley Dod 2270, Raspenberg Vley; Wolley Dod 3357, stream beyond Retreat and Muizenberg Vlei; Schlechter 9899, Villiersdorp, 900 ft.; Schlechter 9065, Tulbagh Waterfall; Bolus 253, Graaff-Reinet, 2500 ft.; Salisbury 377, Grahamstown; Hilner 250, near sea-level, common amongst grass in fairly damp spots near East London West; Galpin 2365, 2421, near Queenstown; Baur 849, Shiloh, 3500 ft.; Rogers 839, Standerton; Burtt-Davy 13088, Christiana.

Distribution.—The species occurs in Europe, Central Asia, and throughout Africa. In South Africa the var. *tenuiflorus* occurs in all but the driest parts, though its occurrence seems to be rather patchy everywhere. Clarke also records the occurrence of this variety from several localities in tropical Africa.

Remarks.—I doubt whether *C. longus* can be kept specifically distinct from *C. rotundus*. Both the spikelets and the vegetative organs vary considerably. In the "Flora of Tropical Africa," VIII, 366, Clarke admits that "the series of species from *C. rotundus* down to *C. tuberosus* are too close together."

PLATE XIX (Rattray 731).

Cyperus immensus C. B. Cl.

"Flora Capensis," VII, 184; "Flora of Trop. Africa," VIII, 371.

A.—Plant, half natural size.

B.—Floral glume, magnified ten times.

C.—Gynaecium, with one of three stamens, magnified ten times.

South African Specimens Examined.—Hilner 132, about four miles west of Kingwilliamstown, common along river; Galpin 2791, banks of Buffalo River, Kingwilliamstown; Sim 2834, Kingwilliamstown; Hilner 212, very common on marshy soil, about eleven miles west of East London; Rattray 731, East London; Schönland 4071, river-bed about nine miles north-west of Port St. Johns, and at bottom of Umlengana Pass; Mogg 6047, Mtunzini, Zululand, 150 ft.; Mogg 6779, Tweedie, Natal; (?) Leendertz 57, Schoonspruit.

Distribution.—Scattered in tropical Africa. In South Africa it occurs just west of Kingwilliamstown and East London, near Port St. Johns, in Natal, and is also recorded from the Orange Free State and Natal. Judging from the records, its occurrence in South Africa is discontinuous.

Remarks.—This is the most showy South African cyperaceous plant, and should be introduced into cultivation. When nearly ripe, the spikelets become pale chestnut-brown. The inflorescences are usually much fuller than the specimen illustrated.

MARISCUS Gaertn.

This genus is often placed as a subgenus under *Cyperus* L., from which it is only distinguished by the rhachilla disarticulating below the lowest fertile glume from a cushion, falling off in one piece (compare *Kyllinga*). Clarke in "Flora of Tropical Africa," VIII, 377, gives the following subsidiary aids to the rapid discrimination of *Cyperus* from *Mariscus*: (1) all the leafless examples must be *Cyperus*; (2) all the examples with less than five nuts to the spikelet must be *Mariscus*; (3) all the examples with the rhachilla of the spikelet wingless must be *Cyperus*.

There are altogether about 180 species in all warm and warm-temperate regions, none in Europe (except *Mariscus congestus* ?). In America a few reach Canada and Patagonia. Twenty-six species are described in the "Flora of South Africa." Several of these are doubtfully distinct. *M. binucifer* C. B. Cl. (Wilms 1623, Lydenburg, and Schlechter 6433, 6664, Natal) and *M. pseudovestitus* C. B. Cl. (Schlechter 3115, 3310, Natal, and Daly 669, Grahamstown) were described in Kew Bull., Add. Ser. VIII (1908), 13. Some South African species are largely represented also in tropical Africa; others are closely allied to tropical African species. The curious distribution of *Mariscus congestus* (Vahl) C. B. Cl. (see page 31) does not necessarily raise any phytogeographical problems, as it often occurs in cultivated land, and may have been spread by man with impure seeds. The recurved glumes of *M. Rehmannianus* and *M. Cooperi* give their inflorescences a peculiar appearance, reminding one of *Scirpus hystrix*, *Sc. varius*, *Cyperus aristatus*.

Plate XX (Daly 676).

Mariscus capensis Schrad.

"Flora Capensis," VII, 186.

A.—Plant, natural size.
B.—Gynaecium, magnified eight times.
C.—Floral glume, magnified eight times.
D.—Deciduous portion of spikelet, with nearly ripe nut, magnified eight times.

Specimens Examined.—Daly and Sole 105, Grahamstown; Daly 676, Trapps Valley; Hutton 1582, near Fort Brown; Hilner 193, eleven miles west of East London, near sea-level; Hepburn 206, Majuba Nek, Herschel District; Mogg 6238, Imfulazane, Zululand, 2900 ft.; MacOwan, Somerset East; Bolus 6238, Imfulazane, Zululand, 2900 ft.; MacOwan, Somerset East; Bolus, Graaff-Reinet; Moran 63, Kimberley; Burtt-Davy 4523, Kimberley; Marloth 1108 [co-type of *M. Marlothii* (Boeck.)]; Rogers 12159, Germiston; Mogg 18232, Onderstepoort; Rogers 2569, Witbank; Schlechter 3779, Botsabelo, Transvaal, 1600 ft.; Lugard 142, Kwebe Hills, Ngamiland; (?) Schlechter 11926, Ressano Garcia.

Distribution.—The species is almost confined to the eastern and north-eastern parts of temperate South Africa, but penetrates to the mountains of the Karroo, and also slightly into tropical Africa. Its altitude ranges from near sea-level to over 4000 ft.

Remarks.—I have sunk *M. Marlothii* (Boeck.) in this species. Comparing the description of the former in Engl. "Bot. Jahrb.," XI, 407, with Boeckeler's own description in "Linnaea," XXXVI, 378, of *M. capensis* Schrad., I can find hardly any tangible difference between them. Clarke in the key of *Mariscus*, "Fl. Cap.," VII, 185, says of *Marlothii* the spikes are peduncled and the spikelets obtuse, but in the specimens of Marloth 1108 which I have before me the spikes are all sessile and the spikelets are, exactly as in typical *M. capensis*. In fact, the length of the peduncles varies greatly, and the shape of the spikelets changes slightly as the nut develops. I may add that the shape of the spikes also does not afford a reliable specific distinction. Burchell 5020, from "rocky hill near Groot River, Uniondale Division" (which, however, I have not seen), probably does not deserve a special name as a variety (*M. Marlothii* var. *globospica* C. B. Cl.), and certainly should not be treated as a distinct species.

PLATE XXI (Daly 674).

Mariscus vestitus C. B. Cl.

"Flora Capensis," VII, 188; "Flora of Trop. Africa," VIII, 385.

A.—Plant, natural size.
B.—Flower, magnified nine times.
C.—Floral glume, magnified nine times.

South African Specimen Examined.—Daly 674, Trapps Valley, Bathurst Division.

Distribution.—Evidently rather discontinuous. East Africa, Natal, and south-eastern Cape Province.

Remarks.—The only specimens seen by me agree well with the description. The closely allied *M. pseudo-vestitus* C. B. Cl. (Schinz's "Beiträge," XIX, 709 [1906]) was found by Schlechter (3145) at Clairmont, Natal. It also occurs at Adam's Mission, Amanzimtoti (Bews 15) in fairly dry grass veld, and at Trapps Valley (Daly 663). It may be simply a form of *M. vestitus* which has adapted itself to dry conditions. In one flower of Daly 674, four style-branches were seen.

PLATE XXII (Flanagan 1016).

Mariscus sieberianus Nees.

"Flora Capensis," VII, 189; "Flora of Trop. Africa," VIII, 388;
Clarke "Ill. of Cyp.," t. 23, 5-7.

A.—Plant, natural size.
B.—Spikelet, magnified eight times.
C.—Floral glume, magnified eight times.
D.—Gynaecium, magnified eight times (ovary covered with a pentagonal pattern, which is not represented).

South African Specimens Examined.—Salisbury 378, Grahamstown (see remarks below); Potts 211, Port Alfred; Flanagan 1016, Komgha; Pegler 1088, Kentani, on waste land; Schlechter 6349, Umtata; Galpin 2845, near Port St. Johns; Mogg 6253, 6096, Zululand.

Distribution.—Widely spread in tropical Africa, the Mascarene Islands, India, Malaya, tropical Australia, and Polynesia; rare in America. In South Africa it extends from the tropics in a narrow south-eastern coast strip to Grahamstown from near sea-level to 3500 ft.

Remarks.—Clarke, in "Flora Cap.," VII, 189, states that Bentham would have regarded the five following species as mere varieties of *M. sieberianus*.

In the "Flora of Tropical Africa," VIII, 389, besides enumerating two varieties himself, he says: "The eleven following species are, in the opinion of competent botanists, only forms of *M. sieberianus*." The structure of the spikelet is certainly no safe guide in discriminating these species. Thus I found in Flanagan 1016 in the same inflorescence: a spikelet with one bisexual flower, and above it two male flowers; another started at the bottom with a male flower, then a bisexual one, then came an elongated portion of the rhachilla, and above this two male flowers. Salisbury 378 differs from the type. The basal sheaths of the leaves are here inflated almost after the manner of *M. capensis* Schrad.

PLATE XXIII (Daly and Cherry 923, Potts 206).

Mariscus congestus Vahl.

"Flora Capensis," VII, 191.

A.—Plant, half natural size.

B.—Lower portion of plant, showing stolons (Potts 206), half natural size.

C.—Flower (only one of three stamens drawn), style-branches abnormal, magnified five times.

D.—Floral glume, magnified five times.

South African Specimens Examined.—Schlechter 198, Claremont Flats, near Capetown; Wolley Dod (*sine no.*), Kloof, west slopes of Lion's Head; Schlechter 2226, near George; Fourcade 1156, Flats, Witte Els Bosch; Britten 1207, Hofmansbosch, Zitzikama, in cultivated land; Paterson 547, Schoenmakerskop, near Port Elizabeth; Paterson 546, Walmer; Zeyher 504, 4356 (var. *brevis* C. B. Cl.), damp places in the dunes between Coega and the Zwartkops River; Holland 94 and Schönland 3191, near Zuurberg Sanatorium; MacOwan 496 (var. *glandulifera* C. B. Cl.), Schönland 718*a*, Daly and Cherry 923, near Grahamstown; Hilner 260, Governor's Kop, Grahamstown; White (*sine no.*), Kleinemonde; Potts 206, Port Alfred; Rattray 732, East London; Sim 2855, Kingwilliamstown; Sim 2833, Dohne Hill; Hilner 362, 363, between Stutterheim and Cathcart; Flanagan 1263, Komgha (with exceptionally long spikelets); Flanagan 957, Kei mouth; Pegler 1085, Kentani; Schlechter 6279, Idutywa; Schlechter 6351, Umtata; Mogg 1640, 18476, Kokstad; Mogg 17708, Rosetta, Natal; Galpin 2386, mountains, Finchams Nek, Queenstown; Hilner 351, Berry Reservoir, Queenstown; Baur 360, Bazija; Baur 845, 850, Shiloh; Hepburn 207, Majuba Nek, Herschel District; Dieterlen 209, Phillips 671, 909, Leribe, Basutoland; Pott 5220, Mariviestad; Beeton 109, Wakkerstroom; Leendertz 3109, Ermelo; Schönland (*sine no.*), Pretoria; Burtt-Davy 17175, Vereeniging; Adams 58, Warrenton; Orpen 242, St. Clair, Herbert District; Tyson 143, between Murraysburg and Graaff-Reinet; Bolus (*sine no.*) Graaff-Reinet.

Distribution.—This is the most common and widely spread of South African cyperaceous plants. It is found in fairly damp ground from Capetown to Natal, in the Transvaal, near Kimberley, and extends to the mountainous parts near Graaff-Reinet and Murraysburg. It is not recorded from tropical Africa, but Eyles 1465, collected at Rusapi, 4600 ft., Rhodesia, must be placed under it. This has straw-coloured spikelets. The species is also recorded from St. Helena, the Mediterranean region, and Australia. In South Africa it ranges from near sea-level to about 6000 ft.

Remarks.—Unless the fruits are ripe, this species is difficult to recognize as belonging to *Mariscus*, as it is somewhat similar to species of *Cyperus*. In spite of great variations in the structure of the inflorescence, the length of the spikelets, and consequently the number of flowers, and even to a certain extent of the vegetative organs, I am unable to acknowledge Clarke's varieties *glandulifera* and *brevis*. The specimens of MacOwan 496 which I have examined had no yellow gland below the two lowest empty glumes. Stolons seem to be developed in sandy ground, and to a large extent the other differences seen, when a large series of specimens are examined, are evidently also due to differences in climate and soil. It is found in damp places (even in sand-dunes), but extends sometimes to fairly dry pastures.

PLATE XXIV (Cotterell 40).

Mariscus riparius Schrad. var. *robustior* C. B. Cl.

"Flora Capensis," VII, 193.

A.—Plant, half natural size.

B.—Floral glume, magnified five times.

C.—Young flower, with only one of three stamens represented, magnified five times.

South African Specimens Examined.—Drege (without number or locality); Rogers 16083, Fishhoek; Fourcade 834, Flats, Witte Els Bosch; Galpin 4833, wooded kloof, Humansdorp; Rogers 2936, Humansdorp; Paterson 834, Port Elizabeth Valley; Salisbury 255, Dassie Krantz, Grahamstown; Britten 733, Tebe River, east of Port Alfred; Cotterell 40, Cathcart.

Distribution.—In the coast districts from the Clanwilliam District (Olifants River) to the Bathurst and Cathcart Districts (or to Natal, if *M. Grantii* C. B. Cl. be included in it).

Remarks.—I have a note that Junod 77, Rikatla, near Delagoa Bay, is this species, but this requires confirmation. Amongst the specimens mentioned, only Drege's appears to represent the type. The varieties *β robustior* C. B. Cl. and *γ trisumbellatus* C. B. Cl. seem to grade into one another so much that I do not feel inclined to assign most of my specimens to either of them; Galpin 4833 is, however, decidedly var. *trisumbellatus* C. B. Cl. I have not seen var. *gillii* C. B. Cl.

COURTOISIA Nees.

"Spikelets compressed, one- to ten-flowered, disarticulating in one piece above the two lower empty glumes. Fertile glumes distichous, boat-shaped, narrowly winged on the keel. Style trifid, persistent. Nut narrowly oblong, trigonous. Glabrous annuals. Stems naked, i.e. bearing all the leaves close to the base, the inflorescence at the top. Leaves as long as the stem, $\frac{1}{8}$ in. to $\frac{1}{6}$ in. broad, green weak. Umbel simple or compound; bracts similar to the leaves, overtopping the umbel. Spikelets four to twelve together, clustered in subglobose heads, yellow to brown.

"Species two, one of which is common in India. This genus only differs from *Mariscus* by the extension of the keel of the fertile glume into a narrow wing, glistening by reason of the loose tissue, and should perhaps be merged in *Mariscus*" (Clarke in "Flora of Trop. Africa," VIII, 403).

Some authors (e.g. Engler in "Die Pflanzenwelt Afrikas," II, 193) make *Courtoisia* a subgenus of *Cyperus*.

PLATE XXV (Schlechter 4770).

Courtoisia cyperoides Nees.

Var. *spicata* C. B. Cl., in "Bull. de l'Herb. Boiss.," 2nd. ser. IV (1904), p. 996.

A.—Plant, natural size.

B.—Spikelet, eight times natural size, slightly pulled apart.

C.—Portion of spikelet which becomes detached when the nut ripens, six times natural size. The empty glumes are very thin and transparent.

D.—Young nut, six times natural size. The surface is minutely facetted, the pattern being shown more highly magnified.

Distribution.—Tropical Africa, Madagascar, and India. Schlechter 4770, "Ad flumen Maxalaquena, Transvaal, 4200 ft.," is the only record from the Union of South Africa.

Remarks.—Clarke in "Fl. Trop. Afr.," VIII, p. 404, states that connecting forms occur between the two species known, and that they can hardly be kept distinct.

ELEOCHARIS R.Br.

Five species are described in the "Flora Capensis," VII. Of these, two (*E. Schlechteri* and *lepta*) are endemic, one (*E. limosa*) is found in South Africa and Madagascar, one (*E. fistulosa*) extends through tropical Africa and Asia, one (*E. palustris*) is distributed throughout the world (except Australia). The two endemic species are found in south-west Cape Province; *E. limosa* has a wide distribution, chiefly in the southern and south-eastern coast districts; while the remaining ones are eastern species. *Eleocharis* cannot be said to be sharply separated from *Bulbostylis* on purely technical grounds, but it seems to be a very natural genus.

E. Schlechteri C. B. Cl. was figured by De Wildeman in "Plantae Novae vel minus cognitae ex Herb. Horti Thenensis," t. VI, fig. 10–17 (1904).

PLATE XXVI (Mogg 5897).

Eleocharis limosa Schult.

"Flora Capensis," VII, 198.

A.—Plant, half natural size.
B.—Floral glume, magnified six times.
C.—Flower, magnified six times.

South African Specimens Examined.—Schlechter 9892, in wet places, Riverzondereinder 700 ft.; Paterson 856 and J. L. Drege 347, Baakens River Valley, Port Elizabeth; Zeyhe 4423, Zwartkops River; Rattray 627, Redhouse; Bennie 371, MacOwan 1543, Grahams' town; Britten 749, Port Alfred West, vlei; Sim 1371, Mt. Coke; Flanagan 903, swamps near Komgha; Wood 809, swamps, Sydenham, Durban; Mogg 5897, Mtunzini, Zululand; Moss and Rogers 1187, Carolina; Beeton 188, Wakkerstroom (the last has acute glumes, otherwise typical).

Distribution.—In South Africa, in the coast districts from Malmesbury to Zululand, also in the Transvaal, otherwise only in Madagascar, but closely allied to an Abyssinian species.

FIMBRISTYLIS Vahl.

Eight species are recorded from South Africa, all of which are found in tropical Africa (where twenty-eight species are recorded), and have even a much wider distribution. Two of ours are found in the west, in the Clanwilliam District, while the remaining six inhabit the eastern and north-eastern grass veld. For the relations of the genus to other genera, see p. 35.

PLATE XXVII (Mogg 3633).

Fimbristylis diphylla Vahl.

"Flora Capensis," VII, 200; "Flora of Trop. Afr.," VIII, 415; Clarke, "Illustr. of Cyp.," 42, 1–4.

A.—Plant, natural size.
B.—Floral glume, magnified twenty times.
C.—Gynaecium (with pale yellow nut, nearly ripe), magnified twenty times.
D.—Pattern on nut.

South African Specimens Examined.—Pegler 1090, Kentani, in marsh and (in 1904) common amongst veld grass; Flanagan 2609, Isinuka, near St. Johns, 100 ft.; Schlechter 6392, Tina River, 3600 ft.; Bews 4, Maritzburg; Wood 8583, Dargle; Mogg 1252, 1266, Tweedie; Mogg 558, 3633, Lidgetton.

Distribution.—Found in all warm and warm-temperate regions, in South Africa not west of Kentani.

Remarks.—Clarke (in "Fl. Cap.," VII, 201) says: "The most abundant and widely distributed of sedges, having (when most narrowly diagnosed) 140 names," which may serve as an excuse for questions of synonymy being left severely alone by me as a rule.

PLATE XXVIII (Hilner 294).

Fimbristylis exilis Roem. et Schult.

"Flora Capensis," VII, 201; "Flora of Trop. Afr.," VIII, 418; Clarke, "Illustr. of Cyp.," t. 45, 1–3; Engler, "Die Pflanzenwelt Afrikas," II, 201.

A.—Plant, natural size.

B.—Floral glume, magnified ten times.

C.—Gynaecium, magnified ten times.

D.—Nut, magnified ten times.

South African Specimens Examined.—Hilner 294, amongst tall grass, eleven miles west of East London; Flanagan 2313, sandy spots along the Kei River, near Komgha; Wood 464, in cultivated ground, Durban, 250 ft.; Galpin 1461, Johannesburg; Adams 222, Warrenton; Rogers 6566, Mochudi; Rogers 12513, Tzaneen, northern Transvaal. Schlechter 2957, Clairmont, Natal, may also belong here, but it is only represented by very small specimens, probably seedlings which have flowered early.

Distribution.—Common throughout tropical Africa and Madagascar; rare in tropical America. In South Africa it does not penetrate from the north-east farther than a few miles west of East London.

Remarks.—The most obvious connecting link between *Fimbristylis* and *Bulbostylis* (see Clarke in "Fl. Cap.," VII, 202).

PLATE XXIX (Daly 824).

Fimbristylis monostachya Hassk.

"Flora Capensis," VII, 203; "Flora of Trop. Afr.," VIII, 424.

A.—Plant, natural size.

B.—Floral glume, magnified four times.

C.—Gynaecium, magnified four times.

D.—Nut, magnified four times.

South African Specimens Examined.—Daly 824, Sidbury; MacOwan 188, amongst grass near Grahamstown; Hilner 105, common in sandy soil above Cemetery Hill, Kingwilliamstown; Hilner 180, fairly common all over veld not far from the sea, eleven miles west of East London; Rattray 815, East London; Galpin 2548, 7732, Finchams Nek, Queenstown; Baur 412, Bazija; Dieterlen 549, Leribe, 5–6000 ft.; Flanagan 914, pastures near Komgha; Pegler 1096, veld, Kentani; Schönland 3829, fairly common on slope towards Umtata Waterfall; Wood 4918, Natal; Schlechter 2897, 2923, amongst grass, Verulam; Schlechter 3132, Clairmont, Natal; Wood, 10428, Maritzburg; Mogg 6033, marsh, Mtunzini, Zululand; Mogg 5925, *ibid.*, but in drier localities; Burtt-Davy 15204, Vereeniging; Theiler, Pretoria North; Beeton 139, Wakkerstroom, 6200 ft.

Distribution.—In nearly all tropical and warm-temperate regions. In South Africa it is found in the Transvaal, and in the coast districts, inland as far as Basutoland, and westwards to a short distance beyond Grahamstown.

Remarks.—Strong plants growing in damp localities may develop a thickish rhizome several inches long.

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BULBOSTYLIS Kth.

There are about seventy-five species found in the tropics or warmer regions of the world, especially in Africa and America, one species extending to Canada. In the "Flora Capensis," VII, fifteen species are recorded, of which five (*B. humilis, breviculmis, parvinux, Burkei,* and *Kirkii*) do not occur in tropical Africa. With the exception of *B. humilis,* none of them is found west of the Alexandria District. To those mentioned in the "Flora Capensis" the following have to be added: *B. trichobasis* C. B. Cl. (described in "Fl. Trop. Afr.," VIII, 445) and *B. Schlechteri* C. B. Cl. (in Kew Bull., Add. Ser., VIII, 1908, 26—Schlechter 3634, Aapies River, Pretoria). Many species of *Bulbostylis* have the aspect of *Ficinias.* Many of them are found in dry pastures, and are much more independent of permanent moisture than most *Cyperaceae* (including the closely allied *Fimbristylis*).

A very thin line separates this genus from *Fimbristylis* and *Eleocharis.* In the former the thickened style base is deciduous, whereas in *Bulbostylis* it remains on the nut. *Eleocharis* retains the thickened style-base on the nut, but the flower has three to nine hypogynous bristles; but these may be entirely absent, "in many species only sometimes present, in some species never seen" (Clarke in "Flor. Trop. Afr.," VIII, 405).

Plate XXX (Moss 243).

Bulbostylis trichobasis C. B. Cl.

"Flora of Tropical Africa," VIII, 445.

A.—Plant, natural size.
B.—Floral glume, magnified seven times.
C.—Gynaecium, with one of the three stamens, magnified seven times. (Normally there are only three style-branches.)
D.—Top of stamen, more highly magnified.
E.—Base of style and top of ovary, magnified.

Specimens Examined.—Dieterlen 646, 721, Leribe; Moss 243, grass veld near Johannesburg; Phillips, Groenkloof, near Pretoria, common; Schlechter 3338, Mooi River, 6000 ft.

Distribution.—Basutoland and Transvaal, also in the Lower Congo, East Africa, and Nyassaland.

Remarks.—This remarkable species is not included in the "Flora Capensis," Pfeiffer in "Weig. Herb." 54 (1920), 33, and "Revision der Gattung *Ficinia*," Bremen, 1920, 19, has described Schlechter 3338 as *Ficinia atrostachya.* He also quotes under this new species Schlechter 3306, which is *Bulbostylis schoenoides* Kth.

Plate XXXI (Tyson 1919).

Bulbostylis humilis Kth.

"Flora Capensis," VII, 205.

A.—Plant, natural size.
B.—Floral glume, magnified seven times.
C.—Nut, magnified seven times (yellowish green, and with indistinct longitudinal lines).

Specimens Examined.—Schlechter 4024, Kl. Olifants River, 5500 ft.; Tyson 1919, Boschberg; MacOwan 1358, in semi-karroid pastures near Grahamstown and near Somerset East; MacOwan 1348, amongst grass near Grahamstown; Daly and Sole 43, near Grey Reservoir, Grahamstown; Daly 687, Trapps Valley; Sim 1901, Pirie; Hilner 192, plentiful everywhere in the veld, eleven miles west of East London; Schlechter 6445, Insiswa mts., 5800 ft. Some of these specimens show indistinct longitudinal striations on the nut, and connect with *B. striatella* C. B. Cl. (Clarke, "Illustr. of Cyp.," t. 44, 11–13), of which I have examined the following specimens: Buchanan 86, Natal; Dieterlen 471, Leribe, and some which were sent to the Union Department of Agriculture from Standerton, and described as a troublesome weed.

Distribution.—Southern and south-eastern coast districts to Natal, and also recorded from the Orange Free State.

Remarks.—*B. striatella* C. B. Cl. cannot be specifically separated from *B. humilis.* They are only distinguished by the fact that in the former the nut is distinctly longitudinally striate, but intermediate forms of the nut are common.

PLATE XXXII (Baur 285).

Bulbostylis scleropus C. B. Cl.

"Flora Capensis," VII, 207; "Flora of Trop. Afr.," VIII, 436.

A.—Plant, natural size.
B.—Floral glume, magnified four times.
C.—Gynaecium, magnified four times.
D.—Stamen, magnified four times.
E.—Base of stamen, more highly magnified.
F.—Base of style and top of ovary, magnified.

South African Specimens Examined.—Baur 285, moist spots, Bazija, 2000 ft.; Dieterlen 335, 605, Leribe, 5-6000 ft.; Mogg 5602, Glen Arum, Balgowan, Maritzburg District; McCallum, New Agatha, Pietersburg.

Distribution.—This species, in addition to the localities mentioned above, has only been recorded from the Aapies River and Mount Mlangi, Nyassaland.

Remarks.—The eared base of the anthers is noteworthy. Compare *Tetraria.*

PLATE XXXIII (MacOwan 1972).

Bulbostylis collina Kth.

"Flora Capensis," VII, 208; "Flora of Trop. Africa," VIII, 432.

A.—Plant, natural size.
B.—Floral glume, magnified eight times.
C.—Gynaecium, with two of the three stamens.
D.—Top of stamen, magnified.

South African Specimens Examined.—Ecklon and Zeyher, grassy hills near Addo; Daly and Sole 44, 103, 104*b*, 237, MacOwan 1972, Daly 75, near Grahamstown, amongst grass, especially in sandy soil and in rocky localities; Daly 706, Trapps Valley; Rattray 256, 257, Hogsback; Hilner 106, Kingwilliamstown, common on hill above cemetery, in sandy soil; Flanagan 923, pastures near Komgha; Flanagan 2360, grassy slopes near Kei mouth; Schlechter 2887, near Verulam, 50 m.; Wood 1352, Inanda; Mogg 6212, 6213, on ridges, Melmoth, Zululand, 2900 ft.; Galpin 1021*b*, Havelock Concession, Swaziland; Dieterlen, Leribe.

Distribution.—In South Africa it extends, mostly at moderate altitudes, from the neighbourhood of Uitenhage to Swaziland; it is also recorded from the hills above the Aapies River. In tropical Africa it is recorded from East Africa and the Eritrea.

Remarks.—"There are numerous very closely allied species" (Clarke in "Fl. Cap.," VII, 208). As far as South African species are concerned, it is distinct, though varying in various directions, e.g. the glumes are occasionally obtuse, the keel not being excurrent. I found in one Grahamstown specimen that a spikelet had only the two lower flowers with fertile stamens; the upper were female, with sterile stamens.

SCIRPUS L.

A cosmopolitan genus of about 130 species. In the "Flora Capensis" fifty species are distinguished. Since its publication, Clarke has (in Kew Bulletin, Add. Ser., 1908) described *Sc. semiuncialis* (Schlechter 8118, Zout River, alt.

100 m., figured by De Wildeman in "Pl. Novae Hort. Then.," 1904, t. VI) and *Sc. muricinux* (Buchanan 163, Orange Free State). In addition, there are about half a dozen undescribed species from South Africa in South African herbaria. Only twenty-six are enumerated by Clarke in the "Flora of Tropical Africa"; of these the sections *Nemum* C. B. Cl. and *Micheliani* C. B. Cl. are not represented in South Africa. Six out of ten species belonging to the section *Isolepis* are common to South Africa and tropical Africa; of these, *Sc. verrucosulus* is only recorded from Senegambia, *Sc. cernuus* from the Cape Verd Islands, *Sc. setaceus* and *costatus* from high altitudes in Abyssinia and East Africa (the former extends to Europe and Australia; the latter also found in Madagascar and Tasmania), *Sc. dioecus* only from Damaraland and Hereroland, while *Sc. fluitans* has a wider distribution in tropical Africa. Of the nine species recorded from the sect. *Euscirpus* in tropical Africa, seven are found in South Africa. Of these *Sc. lacustris* is very rare both in South Africa and tropical Africa, *Sc. supinus* reaches South Africa in the west, *Sc. quinquefarius*, *articulatus*, and *corymbosus* in the north-east, while *Sc. maritimus* and *Sc. littoralis* are widely distributed in the coast districts of South Africa. The following extend beyond South Africa, but are not found within the limits of the flora of tropical Africa: *Sc. tenuissimus* (Madagascar), *Sc. antarcticus* (St. Helena, extra-tropical Australia, and New Zealand, in South Africa mainly in south-west Cape Province, absent from the east and north-east), *Sc. nodosus* (St. Helena, St. Paul, temperate Australia, New Zealand, and temperate South America), *Sc. prolifer* (St. Helena, extra-tropical Australia, and New Zealand), *Sc. triqueter* (Europe and Asia).

There remain a large number of endemic species found in South Africa.

The following species have been placed under *Ficinia* by Pfeiffer ("Revision der Gattung *Ficinia* Schrad.," Bremen, 1920): *Sc. costatus* Boeck., *Sc. venustulus* Boeck. *Sc. Ludwigii* Boeck. was figured by Marloth ("Das Kapland," fig. 13).

Plate XXXIV (Glass 750).

Scirpus globiceps, C. B. Cl.

"Flora Capensis," VII, 213.

A.—Plant, half natural size.

B.—Floral glume, magnified six times.

C.—Gynaecium, magnified six times.

D.—Nut, magnified six times.

Specimens Examined.—Zeyher 4390, Riverzondereinde; Zeyher 30, Swellendam; Schlechter (*sine no.* in Herb. Bolus), between Claremont and Kenilworth; Wolley Dod 2813, Kenilworth Racecourse; Wolley Dod 3551, Muizenberg Vley (named by Clarke *Sc. tenuissimus* in Herb. Bol.); Glass 750, Coldspring, near Grahamstown; Schönland, near old convict station, bottom of Howieson's Poort.

Distribution.—South-west Cape Province, extending to Grahamstown, mainly in stagnant water.

Remarks.—This species is very close to *Sc. fluitans*, which is widely spread in the south and south-east coast districts of South Africa, and is cosmopolitan, but shuns very warm parts (in tropical Africa, e.g., found only on the mountains). As regards the vegetative organs, these, as in many other water-plants, are very variable, and are similar to those of *Sc. fluitans*. In the form here figured, the stems and peduncles are much stouter than in the type, the leaves are much shorter, and mostly reduced to broadly lanceolate brownish sheaths, about $\frac{3}{4}$ inch long, with almost setaceous, comparatively short laminae. The spikelets in *Sc. globiceps* only become globose when the nuts ripen. In the specimen figured, the nuts were shining, pale yellow. As in *Sc. capillifolius,* we find in *Sc. globiceps* that the two lowest glumes (sometimes three or four) are much larger and broader than the upper ones, and form a kind of involucre.

PLATE XXXV (Hepburn 325).

Scirpus setaceus L.

"Flora Capensis," VII, 217; "Flora of Trop. Afr.," VIII, 450.

A.—Plant, natural size.
B.—Spikelet, magnified ten times.
C.—Floral glume, magnified thirteen times.
D.—Gynaecium, magnified thirteen times.
E.—Nut, magnified thirteen times.

South African Specimens Examined.—Tyson 587, Murraysburg; Hepburn 325, 385, Sterkspruit, Herschel District; Dieterlen 706, Leribe; Gardiner 1214, Tempe, near Bloemfontein; Stent 5524, Belfast; Bolus 712, Cave Mt., Graaff-Reinet (this has three spikelets to each head).

Distribution.—Frequent in wet places from Europe and Asia to Australia, also on some of the high mountains of tropical Africa, and in South Africa from Graaff-Reinet to the Transvaal, mostly in rather high altitudes (also recorded from the Uitenhage Division without precise locality).

Remarks.—Like many other species of *Scirpus,* this has a distinct gynophore (compare Clarke, "Ill. of Cyp.," t. 46, 47, 48), but without the disc characteristic for *Ficinia.*

PLATE XXXVI (Dieterlen 394).

Scirpus macer Boeck.

"Flora Capensis," VII, 217.

A.—Plant, natural size.
B.—Flower head, magnified four times.
C.—Floral glume, magnified eight times.
D.—Flower, magnified seventeen times.
E.—Glume and nut, magnified eight times.

South African Specimens Examined.—Dieterlen 394, Leribe; Buchanan 88, Orange Free State; Beeton 53, Wakkerstroom; Wilms 6480, Mariviestad; Pott, Mariviestad.

Distribution.—Eastern South Africa in rather high altitudes, Madagascar.

Remarks.—I have not seen the "rather slender rhizome" which this species is said to possess. In the original description of specimens from Madagascar, Boeckeler states "stamina 2, 1." In all my dissections of South African material I only found a single stamen in each flower; but Miss Gower noticed two filaments with one fruit.

PLATE XXXVII (Burchell 5645).

Scirpus membranaceus Thunb.

"Flora Capensis," VII, 224; Clarke, "Ill. of Cyp.," t. 47, 10–12, t. 48, 1–4.

A.—Culms, half natural size.
B.—Flower-head, natural size.
C.—Floral glume, four times natural size.
D.—Anther, four times natural size.
E.—Top of anther, more highly magnified.
F.—Gynaecium, seven times natural size.

Specimens Examined.—Bolus 7187, in damp sandy places between Retreat and Muizenberg; Wolley Dod 2777, Dido Valley, near Simonstown; Bolus 4557, dunes near Groenekloof; Zeyher 1775, damp sandy places, Cape Flats, and dunes near Capetown; Ecklon and Zeyher, Worcester, 1000 ft. to 2000 ft.; Rogers 4144, Mossel Bay; Burchell 5645, Knysna, near the west end of Groene Valei.

Distribution.—South-west Cape Colony.

Remarks.—This, as Clarke says in "Fl. Cap.," VII, 225, is a remarkable plant, reference to which will be found in the introductory portion of this publication (p. 12).

Plate XXXVIII (Galpin 6874).

Scirpus falsus, C. B. Cl.

"Flora Capensis," VII, 230.

A.—Plant, half natural size.

B.—Floral glume, magnified eight times.

C.—Flower, magnified eight times.

Specimens Examined.—Galpin 6874, Ben Macdhui, Wittebergen, Barkly East District, c. 9850 ft.; Flanagan 2010, 2011, Mont aux Sources, 9500 ft.; Dieterlen 594, Leribe; Beeton 14, Wakkerstroom, 7000 ft.

Distribution.—Drakensberg and Transvaal at high altitudes.

Remarks.—The plant has entirely the habit of many species of *Ficinia*, but lacks a disc. Moreover, no setae are known in this genus.

Plate XXXIX (Schlechter 6318).

Scirpus paludicola Kth.

"Flora Capensis," VII, 230.

A.—Plant, half natural size.

B.—Floral glume, magnified ten times.

C.—Gynaecium and setae, magnified ten times.

D.—Nut, magnified ten times.

E.—Lower part of nut, magnified ten times.

Specimens Examined.—*Ecklon and Zeyher, Swellendam; Ecklon and Zeyher, sandy places, Swartkops River; Holland 571, Redhouse; Bolus 771, moist places on mountain tops, Cave Mt., near Graaff-Reinet, 4300 ft.; MacOwan 1964*b*, at the foot of the Boschberg; Rogers 2184*a*, Sandflats; Schlechter 2611, near Grahamstown; Sim 2854, Kingwilliamstown; Hilner 371, very common on the banks of the Toise River, Cathcart District; Flanagan 1259, marshy places near Komgha; Pegler 200, marshes, vleis, streams, Kentani; *Baur 778, Shiloh; Hepburn 274, Majuba Nek, Herschel District; *Dieterlen 1335, near pond, Government Nursery, Mafeteng; Dieterlen 733, Leribe; Tyson 2600, Clydesdale; Mogg 1636, 18513, Kokstad; Bews 26, Maritzburg; Schlechter 6318, Ingunga; Mogg 1129, 1303, Tweedie; Mogg 3069, 5147, St. Ives, Dargle Road; Mogg 6372, Mount Ashley; Potts 1096, Dewetsdorp Road, Bloemfontein; Schlechter 4776, Moosdrift, Transvaal; Theiler, Onderstepoort.

In specimens marked * no bristles were found in the flowers. They belong to the form *decipiens*, which Nees made a separate species.

Distribution.—Very common in many places in south-eastern South Africa, but also found at Swellendam. As a rule, it does not seem to descend to near sea-level. Outside South Africa it is recorded from Madagascar, and I have also seen a specimen from Rhodesia.

Remarks.—Buchanan 163 from the Orange Free State, which Clarke included in this species, has been separated by him in Kew Bull., Add. Ser., VIII, 1908, 30, under the name of *Sc. muricinna.* I have not seen the type, but, judging from the short description, the following may belong to this new species: Potts 1071 and 1323, Bloemfontein; Burtt-Davy, 17375, Vereeniging.

Plate XL. (Wilms 6383).

Scirpus hystrix Thunb.

" Flora Capensis," VII, 233 ; " Flora of Trop. Africa," VIII, 459.

A.—Plant, natural size (an exceptionally large specimen).
B.—Head of spikelets, twice natural size.
C.—Gynaecium, magnified nine times.
D.—Floral glume, magnified nine times.
E.—Glume with nut, magnified nine times.
F.—Nut, magnified twelve times, with its markings more highly magnified.

South African Specimens Examined.—Schlechter 1679, Wynberg; Bolus 4529, in places inundated in winter, Rosebank, and near Kenilworth, Nov.; Wolley Dod 3243, Vaarsche Vley; Ecklon and Zeyher, Worcester; Rehmann 7305, Estcourt; Potts 558, Parys; Dieterlen 835, Leribe; Potts 4833, Koodoospoort; Aaron 1448, Christiana; Breyer 17980, Nelspruit; Schlechter 3941, 5525, Lydenburg; Schlechter 4677, 5510, Moletse River; Wilms 6383, Schlechter 5525, Lydenburg.

Distribution.—Very patchy. Angola, north-west Rhodesia (Broken Hill), and Nyassaland. In South Africa in the west and south-west as far as Worcester, then again in the Drakensbergen, Natal, and the Transvaal. There is not a single record from the large gap in the coast districts in South Africa between Worcester and Natal.

Remarks.—Clarke says " style, hardly any." I did not find it so in some of the specimens dissected, and yet I cannot separate these from *Sc. hystrix* on other grounds. Boeckeler, in " Linnaea," XXXVI, 735, states that the style is bi- or tri-fid. In the " Flora Capensis," this species is associated with *Scirpus isolepis* Boeck. in the subgenus *Micranthae* C. B. Cl. (*Microstyli* C. B. Cl. in " Fl. Trop. Afr.," VIII, 448). This does not take into consideration the presence of a " prophyll " to the flower in the latter, which has led to its being made the type of the genus *Hemicarpha* Nees kept up by numerous cyperologists. I may here mention that the occurrence in South Africa of *Sc. isolepis* is very doubtful. I have not come across it in any of the collections I have examined.

Plate XLI (Galpin 5604).

Scirpus spathaceus Hochst.

" Flora Capensis," VII, 233 ; Clarke, " Ill. of Cyp.," 53, 4–9.

A.—Plant, half natural size.
B.—Spikelet, magnified four times.
C.—Floral glume, magnified eight times.
D.—Female flower, magnified eight times.
E.—Nut with bristles, magnified eight times.
F.—Inflorescence, natural size.

Specimens Examined.—Pearson 3237, Riverside, between Ceres and Leeuwfontein; Bolus 266, Sundays River, near Graaff-Reinet; Galpin 5604, river-bed, Upper Zwart Kei; F. Bolus 161, in marshy ground, Elandshoek, near Aliwal North; Drege and Baur 887, Klipplaat River, near Shiloh; Flanagan 1649, Modder River, near Kimberley.

Distribution.—From Little Namaqualand to the Clanwilliam District, and then eastwards to the Queenstown District, and the neighbourhood of Kimberley.

Remarks.—The number of bristles to each flower is usually five. In the specimens figured there were only three. At the base of the culm there are one or two acute or subacute sheaths. In Flanagan 1649 the lowest was brownish, about one inch long, the upper mottled with reddish-brown spots confluent at base and apex, and nearly four inches long. It is noteworthy that this species is polygamo-dioecious. It was originally described by Thunberg as *Schoenus inanis*, and Clarke remarks in the " Flora Capensis" on its relations to the tribe *Schoenei*.

ERIOPHORUM L.

This genus has ten species in the north temperate and arctic regions, and has only been once found in the Transvaal. It is allied to *Scirpus*. Clarke looks upon the numerous hair-like structures as segments of six hypogynous bristles.

Plate XLII (Bolus 6024).

Eriophorum angustifolium Roth.

" Flora Capensis," VII, 234.

A.—Culm, natural size.

B.—Nut, with some of the numerous bristles, magnified seven times.

Specimen Examined.—McLea in Herb. Bolus 6024, Transvaal.

Distribution.—McLea's specimens are the only ones known from South Africa. In the Bolus Herbarium there is only the scrap here represented. It is in fruit. I doubt whether it is really conspecific with *E. angustifolium*. This species is spread through the north temperate and arctic regions of both hemispheres.

FICINIA Schrad.

Clarke, in " Flora Capensis," VII, 235, says : " This genus differs from *Scirpus* sect. *Isolepis* only by the small obpyramidal gynophore." In this I am unable to follow him. An obpyramidal small stalk, which becomes detached with the nut, is found in many species of *Scirpus*, as well as in other genera. As the stamens arise at the base of this structure, it may well be called a gynophore ; but the main characteristic lies in the fact that there is a small-lobed, somewhat fleshy outgrowth at the base of the ovary surrounding it. Compare the similar structure found in *Scleria, Diplacrum*, and some species of *Fimbristylis*. The lobes are usually three, or at all events there are usually three main lobes. These alternate with the stamens. I adopt the old name " discus " for this structure (see, e.g., Kunth, " Enum." II, 251). Pfeiffer, in his diagnoses of species, speaks of it as " limbus gynophori," but in the diagnosis of the genus (" Revision," p. 15) he calls it a " discus." Pax also speaks of it as a disc. It is very difficult to decide what morphological value to assign to it. As far as we know, it has at present no value in the life of the plant. It does not seem to be a secretary organ, nor can it be of any value in the dissemination of the fruit. It has been looked upon as a rudimentary organ, or, rather, group of organs. The view has repeatedly been expressed that it represents the absent inner whorl of stamens which we find in some *Cyperaceae*, and which we might expect to have existed in all primitive ones. For this view one can urge that (1) the disc often arises late in the development of the flower, (2) the lobes, where three, are clearly alternating with the carpels and with the three stamens, thus occupying the position which the " missing " stamens would have occupied. This interpretation was expressed by Eichler (" Blütendiagramme," I, 119), and Mr. Turrill is also inclined towards it. I was also inclined to adopt it, but I wish to keep an open mind on the subject for three reasons : (1) the lobes are united at the base, whereas the normal stamens in *Cyperaceae* are quite free from one another ; (2) there is no resemblance of the disc to staminodes, and especially there are no vascular bundles entering it ; and (3) it is separated by the gynophore from the insertion of the three fertile stamens.

The "Revision der Gattung *Ficinia* Schrad.," by Dr. H. Pfeiffer, Bremen, 1920, is in some respects a valuable contribution to our knowledge of the genus. *He gives a short account of its anatomical characters, based on lengthy investigations, but comes to the conclusion that they are unsuitable for grouping the species—a fact which must make us cautious in accepting the attempts which have been made to group the genera of *Cyperaceae* on anatomical grounds. There are also chapters on the flowers, fruits, and seeds, the geographical distribution, the relationships of the genus, and the grouping of its species. The following is a short abstract of his arrangement. Full bibliographical references, descriptions and keys to the species of *Ficinia* will also be found in it.

Subgenus 1.—*Eufilicinia* Pfeiff.

Section 1.—*Isolepiformes* Pfeiff.

§ 1.—*Graciliflorae* Pfeiff.

F. filiformis Schrad (incl. *Bergiana* Kth., *pusilla* C. B. Cl., and *rugulosa* C. B. Cl.), *F. contorta* Pfeiff. (= *F. stolonifera* Boeck.), *F. atrostachya* Pfeiff., *F. tristachya* Nees (incl. *albicans* Nees, *micrantha* C. B. Cl., *minutiflora* C. B. Cl., *involuta* Nees, *subacuta* C. B. Cl., *tribracteata* C. B. Cl.), *F. costata* Pfeiff. (= *Scirpus costatus* Boeck.), *F. quinquangularis* Boeck., *F. acuminata* Nees (incl. *Kunthiana* Boeck., *elongata* Boeck., *MacOwani* C. B. Cl.), *F. cinnamomea* C. B. Cl., *F. dasystachys* C. B. Cl., *F. tenuifolia* Kth. (incl. *latinux* C.B.Cl.), *F. acrostachys* C. B. Cl.

§ 2.—*Efoliatae* Pfeiff.

F. lateralis Kth., *F. Schlechteriana* Pfeiff., *F. bicolor* Pfeiff. (= *Scirpus venustulus* Boeck.), *F. trispicata* Pfeiff. (= *F. sylvatica* Kth.), *F. leiocarpa* Nees (incl. *F. punctata* Hochst.), *F. repens* Kth.

§ 3.—*Capitulae* Pfeiff.

F. paradoxa Nees, *F. laciniata* Nees, *F. fastigiata* Nees, *F. gracilis* Schrad., *F. thyrsoidea* Pfeiff., *F. laevis* Nees, *F. brevifolia* Nees, *F. Ecklonea* Nees, *F. foliaceo-bracteata* Pfeiff. (? from Java), *F. truncata* Schrad. (incl. *F. praemorsa* C. B. Cl.).

Section 2.—*Bracteosae* Pfeiff.

§ 4.—*Sickmannia* Nees.

F. radiata Kth.

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* I have so far not been able to check every statement in this work, but a few items on which I have to make remarks may be mentioned : *Ficinia ligulata* C. B. Cl., in Kew Bull., Add. Ser. (1908), 21 (Schlechter 1193) is omitted. Further, there must have been some confusion in Schlechter's numbers, which were at his disposal. This is inexplicable to me, as I find Schlechter has been remarkably accurate in numbering his sets. The following numbers represent in various collections plants different from those described by Pfeiffer : Schlechter 3338 (*F. atrostachya* Pfeiff.—*Bulbostylis trichobasis* C. B. Cl.), Schlechter 3306 (*F. atrostachya* Pfeiff.—*Bulbostylis schoenoides* Kth.), Schlechter 10533 (*F. canaliculata* Pfeiff.—*Phylica parvifolia*), Schlechter 8970 (*F. trinkleriana* Pfeiff.—*Carpha bracteosa* C. B. Cl.). Several of Schlechter's localities have also been wrongly placed in South Africa by Pfeiffer.

§ 5.—*Seticulmes* Pfeiff.

F. indica Pfeiff (= *F. setiformis* Schrad., incl. *varia* Boeck., *capitellum* C. B. Cl.), *F. lithosperma* Boeck. (incl. *Bolusii* Boeck. *lucida* C. B. Cl., *pinguior* C. B. Cl.), *F. canaliculata* Pfeiff., *F. bracteata* Boeck., *F. ixiodes* Nees, *F. trigyna* Pfeiff. (= *F. scariosa* Nees), *F. decidua* Pfeiff., *F. monticola* Kth., *F. compasbergensis* Drege, *F. fascicularis* Nees, *F. anceps* Nees.

§ 6.—*Arboriculmes* Pfeiff.

F. Dregeana Pfeiff. (= *F. pygmaea* Boeck., incl. *F. clandestina* Boeck., from Abyssinia).

Section 3.—*Acrolepiformes* Pfeiff.

F. ramosissima Kth., *F. trichodes* (Schrad.) Benth. et Hook, *F. ferruginea* C. B. Cl., *F. Zeyheri* Boeck.

Subgenus II.—*Pseudofilicinia* Pfeiff.

F. secunda Kth., *F. Trinkleriana* Pfeiff., *F. bulbosa* Nees.

Sub-genus III.—Hemichlaena C. B. Cl.

F. angustifolia C. B. Cl., *F. caricoides* Pfeiff. (= *F. longifolia* C. B. Cl.) *F. capillifolia* C. B. Cl.

Species of uncertain position : *F. nuda* Boeck.

Unknown to Pfeiffer : *F. distans* C. B. Cl. (subgen. *Hemichlaena*), *F. mucronata* C. B. Cl. (allied to *F. micrantha* Boeck.), *F. tenuis* C. B. Cl. in " Flora Cap.," VII, 260.

There are about fifty species of *Ficinia* which, with few exceptions, are almost entirely restricted to Bolus' " South-West Coast Region of South Africa." A few are found in the drier inland parts, e.g. *F. paradoxa*, var. *argyropus* (Hantam Mts., Calvinia, and S.W.), *thyrsoidea* Pfeiff. (Calvinia and Lydenburg), *laevis* (Calvinia, S.W., and Madagascar), *secunda* (S.W., Namaqualand, Kenhardt), *striata* (Thbg.) Kth. (Namaqualand, Kenhardt, and Transvaal?).

F. compasbergensis is found on the mountains near Graaff-Reinet, on the Stormberg, and near Komgha. Eight are recorded from Natal (these include *F. costata* Pfeiff. = *Scirpus costatus* Boeck.). The following are also found in tropical East Africa : *F. filiformis, costata* Pfeiff. (and in Abyssinia and Madagascar), *gracilis, clandestina* (placed by Pfeiffer as a var. under *F. Dregeana* Pfeiff. = *F. pygmaea* Boeck.).

The locality of *F. foliaceo-bracteata* Pfeiff. is very doubtful. It is supposed to come from Java.

Many of the species are distinct xerophytes.

After the publication of the " Flora Cap.," VII, descriptions by C. B. Clarke were published in the Kew Bull., Add. Ser., VIII, 1908, 30, 31, of : *Ficinia mucronata* (Schlechter 8816, Ezelbank), *F. minutiflora* (Galpin 4834, Schlechter 9409, Houwhoek Mts.), *F. ligulata* (Schlechter 1193, Smithstown), *F. distans* (Schlechter 9566, Vogelgat). *F. mucronata* C. B. Cl. and *F. distans* C. B. Cl. were figured by De Wildeman in " Plantae Novae vel minus cognitae ex Herb. Horti Thenensis," t. VII (1904) and *F. minutiflora* C. B. Cl. on t. VIII.

PLATE XLIII (Burchell 8153).

Ficinia radiata Kth.

"Flora Capensis," VII, 237; Clarke, "Ill. of Cyp.," t. 54, 1–5; Marloth, "Flora of S. Africa," IV, t. 9, 7–10, and t. 10, C.; Pfeiffer in "Revision," 36.

A.—Plant, natural size.
B.—Floral glume, magnified five times.
C.—Flower, magnified five times.

Specimens Examined.—Ecklon and Zeyher, mountains near Capetown; (?) 78, in sandy places, Cape Flats; Wolley Dod 2063, Red Hill, Cape Peninsula; Bolus 4228, on hills, Grabouw, near Palmiet River, 800 ft.; Galpin 4837, Bolus 1394, and MacOwan 1205 (Herb. Norm. 1394), above Sir Lowrys Pass; Phillips 1368, Frenchhoek; Galpin 5407, Stellcberg, Riversdale District; Burchell 8753, Nieuwkloof, Houwhoek Mountains.

Distribution.—Restricted to south-west Cape Province. "One of the prettiest plants of the family, its glossy yellow stars ornamenting the ground at damp spots in the flats as well as on the mountains from Capetown to Clanwilliam" (Marloth).

Remarks.—The nut is figured by Clarke (l.c., t. 54, 4), and shows a very conspicuous three-lobed disc.

PLATE XLIV (Schönland 3096).

Ficinia ixioides Nees.

"Flora Capensis," VII, 238; Clarke, "Ill. of Cyp.," t. 54, 1–5; Pfeiffer in "Revision," 42.

A.—Plant, natural size.
B.—Floral glume, twice natural size.
C.—Flower with anthers shed, twice natural size.
D.—Lower part of gynaecium and filaments magnified.
E.—Flower with "glumella," magnified (Schlechter 8888).

Specimens Examined.—Drege 7382, Drakenstein Mountains and Du Toits Kloof, 3–4000 ft.; Ecklon and Zeyher, top of Table Mountain and Winterhoeksbergen, Tulbagh; Wolley Dod 2964, by Wynberg Reservoir, Table Mountain, about 2300 ft.; Wolley Dod 3321, Waai Vley, Table Mountain; J. Shaw 6033, Cedarbergen, 2900 ft.; Schlechter 8888, Koude Bokkeveld, 4000 ft.; Schönland 3096, about three miles from Haarlem towards Avontuur, on damp ground close to railway bridge (found by Mr. Holford Walker).

Distribution.—Though widely spread in south-west Cape Province, this seems to be rather rare wherever it occurs.

Remarks.—This species seems to be very variable. Shaw 6023 (in Herb. Bolus) was doubtfully referred to it by Clarke. One specimen has a distinct woody rhizome nearly an inch long; the leaves are not so distinctly scarious-edged in the lower part as in the type, and the inflorescence is somewhat shorter. It is probably a form growing in a somewhat dry locality, but I do not think it can be separated specifically. Schönland 3096 has the disc as represented on Plate LXXIV. It is different in Clarke, "Ill.," t. 54, and Pfeiffer describes it as mostly trifid or tridentate, with the anterior tooth split.

However, Schlechter 8888 is the most interesting amongst the specimens I have dissected. This was referred to *F. ixioides* without question by Clarke in Herb. Bolus, and is also quoted by Pfeiffer under it, and I quite agree with this. The specimens are much smaller than the type: two inches and less in height. Its most extraordinary character is the association with each flower of an adaxial, linear, obtuse (often rusty red) scale. In the words of Clarke (compare "Flora Capensis," VII, 225, under *Scirpus membranaceus*), this would be a case in which a " glumella " is present by atavism. In one spikelet I found further in one flower a bifid style split down to the ovary, and in another two normal style branches, and in a third three, free down to the ovary. Several spikelets carefully examined showed : three empty glumes, then two or three bisexual flowers, then three or four flowers which appeared to be male only, and in which either two stamens or only one were developed.

PLATE XLV (Potts 205).

Ficinia lateralis Kth. (*F. aphylla* Nees).

" Flora Capensis," VII, 240 ; Clarke, " Ill. of Cyp.," t. 55, 1–2 ; Pfeiffer, in " Revision," 26.

A.—Plant, natural size.
B.—Floral glume, magnified ten times.
C.—Gynaecium, magnified ten times.
D.—Nut, magnified ten times (with smooth dull surface, greenish, with brown top).

Specimens Examined.—Zeyher 4984, 51, clayey spot at Groenepoint ; Fourcade 1197, seashore, Eerste River ; Schlechter 10441, on hills near Papies Vley, 700 ft. ; Muir 1927, marshy ground near Stille Bay, Riversdale District ; Rogers 2880, Assegaibosch, Humansdorp District ; MacOwan 2124, sandy ground near Vanstadens River mouth ; Paterson 1902, Cape Recief ; Paterson 619, Humewood ; Paterson 350, Walmer ; Bolus 9805, sandy dunes, Emerald Hill ; Galpin 6425, New Brighton ; Zeyher 661, dunes near Zwartkops River mouth ; Britten 2116, 2117, 2119, Potts 205, White 50, various places near Port Alfred, on sand-dunes ; Britten 825, Three Sisters (east of Port Alfred), on the middle rock ; Hilner 223, sand on beach eleven miles west of East London, common ; Rattray 726, 1272, on seashore, East London, forming round elevated clumps ; Flanagan 1781, sandy spots near Kei mouth, 50 ft.

Distribution.—Mostly found on sand-dunes close to the seashore from Capetown to Komgha, but occasionally also found inland, e.g. Hex River Kloof and Assegaibosch.

PLATE XLVI (Schönland 3099).

Ficinia stolonifera Boeck.

" Flora Capensis," VII, 243 ; Pfeiffer, in " Revision," 19 (*F. contorta* Pfeiff. *nov. comb.*).

A.—Plant, two-thirds natural size.
B.—Floral glume, magnified ten times.
C.—Gynaecium, magnified ten times.
D.—Nut, magnified ten times (smooth, yellowish).

Specimens Examined.—Schönland 3099, damp ground close to railway bridge, three miles beyond Haarlem on the way to Avontuur ; MacOwan 1974, stony ground, Boschberg ; Paterson 619, Walmer ; MacOwan 490, stony ground, Bothas Hill, near Grahamstown ; Daly 664*a*, Trapps Valley.

Distribution.—From the Cape Peninsula in isolated places to the neighbourhood of Grahamstown, also on the Boschberg and at Van Reenens Pass, Natal.

PLATE XLVII (Paterson 2131).

Ficinia MacOwani C. B. Cl.

" Flora Capensis," VII, 276 ; Pfeiffer in " Revision," 24 [*F. acuminata* Nees, var. *a MacOwani* (C. B. Cl.) Pfeiff.].

A.—Plant, natural size.
B.—Floral glume, magnified ten times.
C.—Gynaecium, magnified ten times.
D.—Nut, magnified ten times (slightly rough, punctate, brownish).
E.—Top of anther, magnified.

Specimens Examined.—Bolus 1399, mountain clefts near Swellendam ; Paterson 2131, 2500, Port Elizabeth.

Distribution.—Only known from the localities mentioned.

Remarks.—This belongs to a difficult group of *Ficinias.* Clarke said in "Fl. Cap.," VII, 246, that *F. acuminata, elongata, Kunthiana,* and *MacOwani* might be united. Pfeiffer in "Revision" has done this, and placed the three last as varieties under *F. acuminata* Nees. The locality of *F. Kunthiana* is not accurately known. The two remaining ones are found in south-west Cape Province. All of them seem to be very local.

Plate XLVIII (Schlechter 10513).

Ficinia truncata Schrad.

"Flora Capensis," VII, 248; Pfeiffer in "Revision," 35.

A.—Flowering stem, natural size.

B.—Lower portion of plant, showing stolons (Zeyher 4418).

C.—Floral glume, magnified eight times.

D.—Gynaecium with one of three stamens, magnified eight times.

Specimens Examined.—Burchell 6262, between the landing-place at Mossel Bay and Cape St. Blaize; Schlechter 10513, hills near Meerkraal, 200 ft.; Zeyher 4418, Ecklon and Zeyher 1038, on calcareous hills between Coega and Zwartkops River; Paterson 331, 3645, Redhouse. I have also seen specimens from Aloes and Sandflats.

Var. *praemorsa* C. B. Cl.—Schlechter 9690, hills near Rietfontein, 150 ft.; Schlechter 7900, Elim, 300 ft.; Bolus 8697, not far from the sea, Elim, 100 ft.; Muir, Elandskop, Albertinia District; Ecklon and Zeyher, between Zwartkops and Sundays River.

Distribution.—From the neighbourhood of Bredasdorp to Sandflats in the Alexandria District, never going far inland.

Remarks.—Already Clarke had placed *F. praemorsa* Nees as a variety of *truncata* Schrad. in Durand and Schinz, "Conspect. Fl. Afr.," V, 645, and this has also been done by Pfeiffer in "Revision," 35, although Clarke separated them again in the "Flora Capensis." Amongst Zeyher 4418 in Herb. Alb. Mus. there is one specimen which has the younger leaves exactly as in *praemorsa,* while the lower ones are partly like those of *F. truncata,* and partly intermediate between the two. This, of course, may represent a hybrid, but I am inclined to follow Pfeiffer, and not keep them entirely separate under two specific names.

Plate XLIX (Ecklon and Zeyher).

Ficinia striata (Thbg.) Kth.

Ficinia setiformis Schrad., "Flora Capensis," VII, 252.
F. indica Pfeiff. in "Revision," 38.

A.—Plant, natural size.

B.—Floral glume, magnified five times.

C.—Gynaecium, magnified five times.

D.—Nut, magnified five times.

E.—Pattern on nut more highly magnified.

Specimens Examined.—See under remarks.

Distribution.—In the sense in which I take this species, it is found in the coast districts of South Africa from Goechas in the west to Port Alfred. Range in altitude from near sea-level to 3000 ft. (Pfeiffer also records it from the Sandriver Division, Transvaal, collected by Mundt. I suspect a mistake here.)

Remarks.—This species was first named by Thunberg [" Prodr.," 16 (1794) and " Fl. Cap.," ed. Schultes, 91] *Schoenus striatus,* found on hills near Capetown and elsewhere. The specific name was adopted by Kunth, " Enum.," II, 257, who placed it under *Ficinia,* and gave an extensive synonymy, which is partly reproduced by Clarke in the " Fl. Cap.," VII, 253. The latter adopted Schrader's name *F. setiformis* Schrad., a name which is not quite appropriate, and had already been scrapped by Kunth. Clarke kept up Boeckeler's *F. lithosperma* (" Linnaea," XXXVII, 72), with which he united *F. Bolusii* Boeck. (Engl. " Jahrb.," V, 506), and also kept up his own *F. lucida* (first mentioned in Durand and Schinz, " Conspectus Fl. Afr.," V, 640). These two species I feel compelled to unite with *F. striata,* though the extreme forms differ considerably from one another. Pfeiffer, in " Revision," 38, adopts Lamarck's name, *F. indica,* which, according to the strict laws of priority, should be adopted ; but surely this is a case where common sense should override these laws. I cannot bring myself to call a species *indica* when it only occurs in South Africa. He united as a variety *F. varia* Boeck. [" Verh. d. Bot. Ver. Brandenburg," XXIX (1887) 4]. Pfeiffer kept up *F. lithosperma* Boeck., and included in it as varieties *F. lucida* C. B. Cl. and *F. pinguior* C. B. Cl. The last one, however, appears quite distinct to me.

I distinguish the following *varieties,* but they cannot be sharply characterized :—

α typica.—Spikelets not firmly enclosed in the involucre, heads ovoid, 2–10 mm. wide. As compared with the other varieties, more delicate in all its parts.

Schlechter 11364, Goechas, western region, 3000 ft. ; Bolus 9478, 9479, Tweefontein, Little Namaqualand—also Piquetberg, without number ; Schlechter 10628, 10694, on hills near Saron (these have really setiform leaves, which does not apply to the other specimens placed under *F. setiformis* Schrad. ; the heads are very small) ; Schlechter 8456, Boschkloof, 700 ft. ; Schlechter 8402, Clanwilliam, 300 ft. ; Schlechter 1239, near Wynberg ; Wolley Dod 2815 and Pearson 284, in water, Kenilworth Racecourse ; Ecklon and Zeyher, Cape dunes ; Zeyher 4395, Cape Flats ; Bolus 4862, Sea Point ; Zeyher 4982, sandy places near Zwartriver ; Zeyher 4410, in stony places in Hassequas Kloof ; Moss 241, near Stellenbosch ; Schlechter 9178, Bains Kloof, 3000 ft. ; Tyson 603, sandy places, Hex River Valley, 1600 ft. ; Pappe, Tulbagh ; Wolley Dod 3720, Hex River Valley ; Stephens 7751, probably Oliphants River Mountains, near Warmbath ; Schönland 3060, Kromme River, Assegai Bush ; Paterson 1071, Walmer.

β Capitellum C. B. Cl.—Two outer leaves of the involucre quite or nearly upright, their basal portions firmly enclosing a large part of the head.

Wolley Dod 2963, 3406, 2269, 2722, Zeyher 4397, Bolus 4016, 4738, Schlechter 1239, Cape Flats and hills near Capetown ; Wolley Dod 3008, marsh at source of Slangkop River ; Duthie 201, Stellenbosch.

γ pallens (*F. lithosperma* Boeck.).—This variety is much more robust in all its parts than *α* and *β*. In some specimens the leaves are 2 mm. wide, the culms 30 cm. high, the heads 12 mm. wide ; intermediate forms connecting with *α* and *β* are common.

Schlechter 10587, hills beyond Rietfontein, western region, 100 ft. (the number of involucral leaves here is greatly increased, up to ten ; the outer are up to 7 c.m. long, the leaves have smooth margins) ; Bolus 4233, Muizenberg Mountain, 1800 ft. (this is the type of *F. Bolusii* Boeck.) ; Wolley Dod 2597, Retreat Flats ; Wolley Dod 2541, Orange Kloof, towards Hout Bay Nek ; Pappe, Cape Flats ; (?) between Sir Lowrys Pass and Palmiet River ; Rogers 1165, Steenbras, Caledon Division ; Schlechter 7427, Houwhoek, 2000 ft. ; Rogers 2812, Assegaibosch, 900–1000 ft. ; various collectors, Port Elizabeth Valley, Humewood, Port Alfred.

δ *compacta* (*F. lithosperma* Boeck., var. *compacta* C. B. Cl.). Vegetative organs as in var. *pallens*. Lower floral bracts dark brown, broad, firmly enclosing the inflorescence.

Bolus 7588, near Tulbagh Waterfall; L. Kensit (Mrs. F. Bolus), slopes of mts. near French Hoek, c., 1100 ft.; Pearson 5230, near top of Piekenierspass, eastern side, damp places; Kondeberg 3400; Schlechter 8754.

In a spikelet of Schlechter 8754 we found one bisexual flower and above it three male flowers. Beyond these there was a long bare prolongation of the rhachilla. In Pearson 5230 a spikelet had four bisexual flowers, above them two male ones, and above these an empty glume. As the specimens examined did not exhibit a disc on the ovary, I did not refer them to *Ficinia*, though Clarke had named Bolus 7588 *F. setiformis* Schrad. *β capitellum*. However, Mr. Turrill referred the above specimens to Clarke's variety of *F. lithosperma*, and I think now that he is quite right, especially as I found in other Ficinias that often the disc is developed late, and may have been overlooked by me in the ripe nut, which is trigonous, and two-thirds the length of the floral glume.

ξ *lucida* (*F. lucida* C. B. Cl.).—Culms arising singly, otherwise like small specimens of γ.

Wolley Dod 1350, beyond Uitvlugt (this was determined by Clarke as *F. lucida* C. B. Cl.); Schlechter 10585, in dunes near Brandfontein.

Plate L (Paterson 2126).

Ficinia bulbosa Nees.

"Flora Capensis," VII, 256; Pfeiffer, "Revision," 49.

A.—Plant, natural size.
B.—Portion of the stem showing the scarious edges of the leaves, magnified.
C.—Tuberous rootstock in section (from Ecklon and Zeyher, Constantia).
D.—Floral glume, magnified ten times.
E.—Gynaecium, magnified ten times (disc not developed).
F.—Anther, magnified ten times.

Specimens Examined.—Kolbe 14305, Van Rhynsdorp, "far from water"; Ecklon and Zeyher, Constantia; Zeyher 4955, sandy places, Camps Bay; Tyson, north slope of Table Mountain; Bolus 4864, damp places, Rosebank and Sea Point; Bolus 4493, in mountain clefts beyond Rondebosch, 300 ft.; Wolley Dod 2961, near Raapenberg; Wolley Dod 2528, Didivalley, Simonstown; Wolley Dod 2964, Smitwinkel Bay; Schlechter 347, Table Mountain, 2500 ft.; Schlechter 10251, Bolus 4076, mountains near Bains Kloof; Rogers 10518, Groot Drakenstein, Paarl; Zeyher 4414, in sandy places, Breede River; Drege, Du Toits Kloof, 2–3000 ft. (one-headed); Tyson 602, 691, H. Bolus 13224, Hex River Valley; Bolus, on hills near Riversdale, *c.* 500 ft.; Fourcade 1197*a*, seashore, Eerste River; Rogers 4677, near Humansdorp; Paterson 766, 2126, 2500, Rogers 4074, Redhouse; MacOwan 726, in sand at the mouth of the Kasouga.

Distribution.—Slightly exceeding the limits of the south-west coast region, as defined by Bolus, chiefly near the sea. Pfeiffer also records it from the Orange Free State (Drege in "arenosis pr. Koesberg"), which is clearly a mistake.

Remarks.—The disc, which was not developed in the specimen figured, is found at a similar stage in other specimens. It is three-lobed. MacOwan 726 differs somewhat from the type: rather straight leaves and main bracts, which, moreover, are distinctly striate; but it is hardly possible to separate it even as a variety, as the development of the leaves is clearly influenced by locality and season, as shown in numerous other specimens.

PLATE LI (Schlechter 8365).

Ficinia secunda Kth.

"Flora Capensis," VII, 257; Pfeiffer in "Revision," 48.

A.—Flowering culm, natural size.

B.—Lower portion of plant, natural size.

C.—Floral glume, magnified eight times.

D.—Gynaecium, magnified eight times.

E.—Stamen, magnified eight times.

F.—Top of stamen, magnified.

Specimens Examined.—*a typica*: Schlechter 3004, sandy places, Olifants River, 400 ft.; Schlechter 8365, Windhoek, 800 ft. (south-west Cape Province).

forma oligostachya Pfeiff.: Bolus 4863, near Capetown; Wolley Dod 3291, Blaekriver Village, Cape Peninsula; Schlechter 1278, at the foot of Muizenberg Mountain, 150 ft.

β maxima C. B. Cl.: Wolley Dod 3231, Slangkop.

Distribution.—Very scattered in the coast districts from Little Namaqualand to Uitenhage. (Pfeiffer states that Schlechter 3004 comes from the Transvaal. This is a mistake.)

Remarks.—Pfeiffer places this species with *F. bulbosa* Nees and his *F. Trinkleriana* in his subgenus *Pseudofilicinia.* I do not know what plant is meant by *F. Trinkleriana.* It is based on Schlechter 8970, which is *Carpha bracteosa* C. B. Cl. [figured by De Wildeman in "Plantae Novae vel minus cognitae ex Herb. Horti Thenensis," t. X (1904)]. The inflorescence of the form *oligostachya* is quite different from the type. The spikelets are here arranged in cymes. Wolley Dod 3231 shows similar arrangement in the upper portion of the inflorescence, while the lower part is like the one figured here. I reserve a fuller discussion of this inflorescence for a future occasion, but I may say here that it does not appear to me that the spikelets in the typical form are subspirally arranged, as stated by Clarke ("Fl. Cap.," VII, 257). The spikelets belonging to each series are placed exactly one above the other, and all but the lowest of each series must be looked upon as accessory shoots.

PLATE LII (Daly and Sole 486).

Ficinia trichodes (Schrad.), Benth.

"Flora Capensis," VII, 258; Pfeiffer in "Revision," 47.

A.—Plant, natural size.

B.—Floral glume, magnified six times.

C.—Flower, magnified six times (the anthers have dropped off).

Specimens Examined.—Schlechter 1103, amongst rocks, top of mountain, Simonstown, 1200 ft. (an ramosissima ?); Hutton, Port Alfred; Daly and Sole 486, Signal Hill, Grahamstown.

Distribution.—Various localities on the Cape Peninsula and Albany and Bathurst Districts.

Remarks.—I have not quoted Schlechter 7551 from the Caledon District, and MacOwan 1901 from the Somerset East District, both of which were placed by Clarke and Pfeiffer under this species. I am not satisfied that either of them belong to it. In fact, the group of species to which *F. trichodes* belongs, and included by Pfeiffer in his sect. *Acrolepiformes*, requires revision. It seems to me that a larger number of species will have to be distinguished.

Plate LIII (Bolus 4736).

Ficinia longifolia C. B. Cl.

'Flora Capensis," VII, 259; Clarke, "Ill. of Cyp.," t. 56, 5–7; Pfeiffer in "Revision," 51 (*F. caricoides* Pfeiff.).

A.—Portion of plant, natural size.
B.—Floral glume, three times natural size.
C.—Gynaecium, three times natural size.
D.—Young nut, three times natural size.

Specimens Examined.—Bolus 4736, Table Mountain, 3000 ft.

Distribution.—This species seems to be restricted to Table Mountain. (Schlechter 9408, from the Caledon Division, quoted by Pfeiffer under it, seems to me to be *F. capillifolia*, C. B. Cl.)

FUIRENA Rottb.

I take this genus in the same sense in which it is usually taken by cyperologists. It is closely allied to *Scirpus*, in which the inflorescence is umbellate, and the stem is not nodose. Apart from these well-known distinguishing characters, I find that at all events the South African species are sharply divided from *Scirpus* owing to the fact that the leaves are provided with a ligule (Plate LV), a membranous structure at the end of the leafsheath, forming a hollow cylinder round the stem. It is often truncate, but in *F. hirta* and sometimes in others it is elongated on the side of the leafblade. Often the sheath splits, and with it the ligule.

Clarke divides the genus into two sections: *Pseudo-Scirpeae* and *Eu-Fuirena* In the former there are no obovate or hastate interior perianth leaves. They are, however, in *F. chlorocarpa*, represented by setaceous, simple scabrous bristles. In the latter there are petals with an obovate lamina (sometimes narrow), but not mere linear bristles (in *F. coerulescens* very rarely wanting altogether).

It will be seen at once how weak the foundations are on which these sections are founded. From most of the descriptions in the "Flora Capensis," and more so from the figures in Clarke's "Illustrations of Cyperaceae," t. 58 and 59, one would think that the shape of the so-called petals, where they occur, would be characteristic for the different species. Dissections of a very large number of South African specimens have shown me that this is not the case, as was known also to Clarke, who, after the description of *F. coerulescens*, says: "The petals of *Fuirena* are probably to be regarded as reduced organs in process of disappearing; the present plentiful species shows that they must not be relied on too absolutely for the discrimination of species. The three petals on one nut of *F. coerulescens* sometimes differ entirely in size and form; in some examples they nearly or quite disappear. Var. β in its nut and long panicle resembles *F. pachyrrhiza*, but then it has fairly developed petals."

There seems to be no choice but to discard the consideration of the presence or absence and the shape of the "petals" and also of the outer bristles which sometimes occur, and if a precedent is necessary for this course, it is furnished by Clarke himself in the treatment of *Scirpus*, subgen. *Eu-Scirpus*.

That the hypogynous structures in *Fuirena*, whether they are in the shape of bristles or more expanded structures, must be looked upon as a rudimentary perianth, in which usually only the inner whorl is developed, will hardly be disputed. Now rudimentary organs in the process of disappearing should have lost their function, and indeed, as far as I can see, no function can be assigned to them here. The glumes form a good protection for the young flowers, and completely hide the petals. There is no possibility that the latter perform a similar function as the lodicules in grasses. They do not aid even in the dispersal of the nuts, since, as far as I have seen, the nuts become detached without them. To say that they are in the process of disappearing is perhaps saying more than the facts warrant, because the distribution of *Fuirena* is very wide and the genus is therefore not likely to be a recent one: and, moreover, the very fact that they are frequently still present points in my opinion to a great antiquity of the genus, if we assume the derivation of the *Cyperaceae* from ancestors with the floral structure of *Liliaceae*. Deterioration of organs which are not used any more is well known, both in animals and plants. To my mind, panmixia sufficiently explains this (see Weismann, "Essays on Heredity," English translation, I, 299). The slowness of the process in these cases is certainly remarkable, and is rightly used by Weismann (*ibid* 300) as supporting the theory of natural selection. Besides the petals, Clarke employs the fruit-characters largely in separating the species. There is the practical difficulty that herbarium specimens often do not have ripe fruits. This, of course, does not vitiate Clarke's standpoint, but it seems to me that these also vary, as I found in some other *Cyperaceae*.

The genus has about twenty-five species, and is found in all warm countries. Eleven species are recorded in the "Flora of Tropical Africa," three of which are also found in South Africa, mainly in the east. None go in the west beyond Clanwilliam, nor are they found in the central parts of South Africa, except on a few mountains. All species are hydrophytes.

To show how I view the South African species, I deviate from the general plan of this work, and give an enumeration of all specimens which I have examined:—

F. chlorocarpa Ridley.

Buchanan 342, Natal (three–six bristles, nut dark grey, almost smooth, indistinctly striate longitudinally); Rogers 23138, White River, Barberton; Schlechter 4124, Wilge River, Transvaal, 4600 ft.

The colour of the nuts varies, also the hairiness of the glumes. Sometimes the latter are almost glabrous.

F. pachyrrhiza Ridley.

Flanagan 970, swamps near Kei mouth, 50 ft.; Pegler 309, marshes near Kentani, 1000 ft.; Dieterlen 1323, Mafeteng; Tyson 2750, Clydesdale, 2500 ft.; Wood 1620, Inanda (this number is quoted by Clarke under *F. coerulescens*; it has pedunculate spikelets and no petals); Wood 1194, Inanda; Mogg 5894, Zululand; Bolus, Houtbosch, Pietersburg District, c. 5000 ft.; Schlechter 3801, Klein Olifant River, 5000 ft.

F. coerulescens Steud.

Var. (*a*) *typica*: petalis aristatis ellipticis vel anguste obovatis.

Zeyher 1757, damp places in the dunes at Kuils River (this was placed by Clarke under *F. gracilis*); Ecklon and Zeyher, sandy damp places, Cape Flats; Wolley Dod 2346, Kloof, west of Lion's Head; Bolus 246, near fountain on Cave mountain, Graaff-Reinet; F. Bolus 192, Elandshoek, near Aliwal North, 4500 ft.; Beeton 148, Wakkerstroom.

Var. (*b*) *glabrescens*: plantae subglabrae, petalis variis (*F. glabra* Kunth and *F. Ecklonii* Nees).

Paterson 347, Bethelsdorp; Ecklon and Zeyher, Olifantshoek; Tyson 1469, boggy places, Kokstad, 5000 ft.; Wood 3144, Ibisi River; Wood 9969, Clairmont, Natal.

Var. (*c*) *latipetala*: petalis variis sed latis stipitatis (*F. gracilis* Kth.).

Kunth says ("Enum.," II, 181): "Habitus *F. coerulescentis*, nisi elatior, squamulae fere *F. hirtae*," and in describing the petals, "squamulis unguiculatis, obovatis uninerviis, mucronatis, apice ciliatis, ibique integris vel 4–5 denticulatis, setulis minutissimis vel nullis." The species was based on Drege's specimens only.

If we now compare this with Clarke's account: "Petals minute, about one-third the length of the nut, clawed, nearly square, nerveless." we see that it does not tally with Kunth's description.

Of the plants mentioned by Clarke in the "Flora Capensis" (VII, 263), I have only been able to dissect Baur 724 and 892. In the former the petals are about the length of the nut, and agree excellently with Kunth's description, while in 892 they nearly agree with Clarke's description.

Baur 892, Shiloh, Queenstown District; Baur 724, banks of the Isikoba River, 2000 ft.; Schlechter 6262, Ibeka, 2300 ft.; Drege, between Gekau and the Bashee River, 1–2000 ft.; Dieterlen 1072, Likhoele, Basutoland; Theiler, Onderstepoort, near Pretoria.

Var. (*d*) *apetala:* flores sine petalis vel rarius petalis minutissimis (*F. pubescens* C. B. Cl., non Kunth?).

Schlechter 511, Claremont, near Capetown; MacOwan 1356 and 1271, Somerset East (1271 has very tiny elongated petals); MacOwan 569, damp places near Grahamstown (it is common in Howiesons Poort, S.S.); Sim 2846, Dohne Hill; Hilner 174, near sea-level, East London; Galpin 5857, Hangklip Mountain, near Queenstown, 5600 ft.; Baur 286, Bazija, 2000 ft.; Tyson 1587, 1421, boggy places, Kokstad; Schlechter 2945, Clairmont, Natal, 50 ft.; Bews 27, Maritzburg; Hutton 66*a*, Shafton, Howick; Flanagan 2051 and Bolus 8283, 8284, Besters Vlei, near Witzies Hoek, 5500 ft.; Dieterlen 534, Leribe, Basutoland; Zeyher 9758, damp places near the Aapies River; Moss 239, Premier Mine; Rogers 6788, Waterval Boven; Schlechter 3801, Klein Olifants River, 500 ft.; Galpin 1363, Umlovati Valley, Barberton; Bolus 9790, between Lourenzo Marques and Komati River Drift.

Fuirena enodis C. B. Cl.

I have not seen a type of this species. The following have rather young flowers, but plainly belong to Clarke's section *Eu-Fuirena,* and otherwise agree with the description of this species.

Schlechter 3700, Mundts Farm, near Pretoria, 4700 ft.; Theiler, Onderstepoort; Beeton 29, Wakkerstroom.

Fuirena microlepis Kth.

Of the numbers quoted by Clarke, I have only seen Wood 213, damp places near Durban. I would have associated it with *F. hirta.* Sim 2712, from Fort Cuninghame, may also belong to this species.

Fuirena hirta Vahl.

In this species the petals vary enormously. This is tacitly acknowledged by Clarke, as he places both *F. erioloma* Nees and *F. intermedia* Kth. as synonyms under this species. They are narrowly obovate in MacOwan 1796; in others they vary from lineate or lanceolate-mucronate to the forms figured by Clarke for *F. glomerata* and *glabra* in "Ill. of Cyper.," t. 59. Setaceous sepals, variable in length, are almost always present. They are absent, e.g., in MacOwan 1796.

Wolley Dod 2362, Kirstenbosch; Zeyher 24, margins of ditches, Cape Flats, Hout Bay. etc.; MacOwan 3136 (Herb. Austr. Afr. 1796), sandy places, Cape Flats; Wolley Dod 2203, roadside beyond Camp Ground; Phillips 1371, Frenchhoek; Duthie 149, Stellenbosch; Ecklon and Zeyher, Worcester; Tyson 618, Hex River Valley; Phillips 11910, near Laaken Vley, Ceres District, Matroosberg, 3500 ft.; Bolus 4227, Grabouw, near the Palmiet River; Pearson 5228, damp places, eastern side, Pikeniers Pass; Bolus 2500, Vlugt, Knysna; Fourcade 958, flats, Oudebosch, Zitzikamma; Schönland 3061, riverside, Assegaibosch Station; Rogers 2912, Humansdorp; Paterson 2370, Walmer; Zeyher 25361, Zwartkops River; Paterson 1925, Uitenhage; Britten 967, Howicsons Poort, near Grahamstown, 1300 ft.; Gane 67, hill above Grey Reservoir, Grahamstown; Hilner 186, eleven miles west of East London, in soft sand near beach; Rattray 811, East London; Flanagan 1005, swamps near Kei mouth, 200 ft.; Pegler 341, occasional, near Kentani.

PLATE LIV (Mogg 5707).

Fuirena coerulescens Steud., var. *apetala* Schönl.

" Flora Capensis," VII, 261.

A.—Plant, natural size.
B.—Floral glume, magnified ten times.
C.—Gynaecium, with one of the three stamens, magnified ten times.

Some specimens placed under this variety are much more slender in all parts than Mogg 5707 (e.g. Moss 239, Flanagan 2071, Sim 2846). They may be united as *forma gracilis.*

PLATE LV (Daly 697).

Fuirena hirta Vahl.

" Flora Capensis," VII, 264.

A.—Plant, natural size.
B.—Portion of culm, twice natural size, showing portion of a leafsheath (v), the ligule (*l*), and the lower portion of a leafblade (*b*).
C.—Floral glume, magnified thirty times.
D.—Flower, magnified thirty times, showing one of the three sepals, the petals, the stamens, and the gynaecium.

LIPOCARPHA R. Br.

The two scales associated with the flowers in this genus have been the subject of much controversy. Clarke, in the " Flora of Trop. Africa," VIII, 468, gives the views regarding them held by various botanists. Palla (in " Ber. d.d. bot. Gesellschaft," 1905) holds that each so-called flower is a reduced spikelet, so that each so-called spikelet is really a compound spike. The diagram of the flower with its scales and bract certainly bears close resemblance to the diagram of the spikelet of most *Kyllingas.* The same view, though on different grounds, was already held by Kunth. [Palla also looks upon the flowers of *Hemicarpha* Nees (doubtfully represented in South Africa by *Scirpus isolepis* Boeck.) and *Ascolepis* R. Br. as reduced spikelets, and certainly his view deserves attention.]

The genus, consisting of fourteen species, is found in the warmer portions of both hemispheres. Ten species are recorded from tropical Africa, of which two extend to the Transvaal and Natal.

PLATE LVI (Teague 520).

Lipocarpha argentea R. Br.

" Flora Capensis," VII, 265 ; " Flora of Trop. Afr.," VIII, 469.

A.—Plant, natural size.
B.—Floral glume, magnified twelve times.
C.—Floral glume and flower, the latter enclosed in two scales, magnified twelve times.
D.—Abaxial scale, magnified twelve times.
E.—Adaxial scale, magnified twelve times.
F.—Bistaminate flower, with anthers discarded, magnified twelve times.
G.—Nut, magnified fifteen times. (A pattern of elliptical small spots on the surface of the nut is not shown.)

South African Specimens Examined.—Rehmann 8192, at the Waterfall, Umbilo, Natal; Zeyher 1759, Magaliesberg; Schlechter 4308, Moord Drift, 4300 ft., Transvaal; Rogers 18211, near Tzaneen, northern Transvaal; Leendertz 6030, Warmbath; Breyer 17979, Nelspruit. (The specimens drawn were collected by Teague in the Odzani River Valley, near Penhalonga, Southern Rhodesia.)

Distribution.—Tropical Africa, extending to the Transvaal and Natal, also in the Mascarene Islands, south-east Asia, and Queensland.

Remarks.—The leafsheaths of this plant are open. The " gynophore " drawn on F. and G. seems to have hitherto been overlooked.

ASCOLEPIS Steud.

This genus is characterized by a large abaxial scale, which in the South African species encloses the flower. It is sometimes called a utricle: Clarke speaks of it as a squamella in the " Fl. of Trop. Afr." Various botanists look upon it as made up of two lateral prophylls. Palla (in " Ber. d.d. bot. Gesellschaft," 1905) has, however, shown conclusively that it is a single leaf, which he looks upon as the floral bract. If this view is correct, then each flower must be looked upon as a reduced spikelet, and the structure which is usually called a spikelet would be a compound spike. This view was strengthened by his finding two flowers together in the axil of one " glume," and if it is correct, a close relationship with *Kyllinga* is established.

Nine species are recorded in the " Flora of Tropical Africa," of which one is also found in South Africa, one also in Madagascar and South America. It may be that there is more than one species in South Africa, because the shape of the " squamella " in Baur 133 is quite different from that figured by Clarke for *A. capensis* in " Illustr. of Cyp.," t. 61, 9.

Plate LVII (Baur 133).

Ascolepis capensis Ridley.

" Flora Capensis," VII, 266; " Flora of Trop. Africa," VIII, 477; Clarke, " Illustr. of Cyp.," t. 61, 8–10.

A.—Plant, natural size.

B.—Floral glume, magnified five times.

C.—Flower enclosed in " squamella," magnified five times (the " squamella" is drawn as if transparent).

D.—Gynaecium, magnified five times.

E.—Nut, magnified five times (the dots represent small depressions).

South African Specimens Examined.—Drege, Katberg, 4–5000 ft.; Rattray 1, Hogsback marshes, 4800 ft.; Sim 1530, Pirie; Cotterell 194, Fairford, Cathcart; Baur 133, Bazija; Tyson 1416, Kokstad; Bolus 10354, Xalanga; Schönland, Port St. Johns, near sea-level; Schlechter 2953, Clairmont, Natal, 15 m.; Wood 126, Inanda; Hutton 374, Shafton, Howick; Buchanan 148, Natal; Simons 119, Giant's Castle; Dieterlen 343, Leribe; Flanagan 1844, Besters Vlei, near Witzies Hoek, 6400 ft.; Cooper 911, Orange Free State; Zeyher 1762, Magaliesberg: Beeton 22, Wakkerstroom, growing in water; Hutton 915, Witwatersrand; Rogers 878, Pretoria; Nelson 12, Hooge Veld, Komati River; Pott 5215, Spitzkop; Franks 9789, Bolus 12432, Belfast.

Distribution.—From the Katberg eastwards in wet places with a wide range of altitude. Also widely spread in tropical Africa.

Remarks.—This plant is often confused with *Kyllinga alba*. The leafsheaths are not closed.

RHYNCHOSPORA Vahl.

" This genus, from its bifid style and persistent enlarged style-base, could not be mistaken for anything but *Fimbristylis*. From this, either the inflorescence or, in the one-headed species, the hypogynous bristles separate it, except in the case of *R. erinacea* " [absent from South Africa] " which has nodes on the stem " (Clarke in " Fl. of Trop. Afr.," VIII, 478). The bristles are absent in some species not found in South Africa. There are four South African species, which, with the exception of *R. spectabilis* (perhaps only a form of *R. aurea*) are very widely spread even beyond tropical Africa. From tropical Africa eight species are recorded. Altogether there are in this cosmopolitan genus over 180 species. In South Africa only *R. glauca* is found west of Pondoland.

All species are hydrophytes.

PLATE LVIII (Wood 11536).

Rhynchospora cyperoides Britten.

" Flora Capensis," VII, 267 ; " Flora of Trop. Afr.," VIII, 479 ; Clarke in " Illustr. of Cyp.," t. 67, 5-8.

A.—Plant, half natural size.
B.—Floral glume, magnified eight times.
C.—Flower, magnified eight times.
D.—Nut, magnified eight times (brown, shiny).

South African Specimens Examined.—Wood 12034, near Durban 100-300 ft. ; Wood 10425, 11536, Umhalasi, Zululand.

Distribution.—Tropical Africa, Mascarene Islands. Very common in America from Mexico to Montevideo. In South Africa only in Pondoland, Natal, and Zululand.

PLATE LIX (MacOwan 1354).

Rhynchospora glauca Vahl.

" Flora Capensis," VII, 268 ; " Flora of Trop. Afr.," VIII, 482 ; Clarke in " Illustr. of Cyp.," t. 73, 7.

A.—Plant, natural size.
B.—Floral glume, magnified six times.
C.—Gynaecium, with bristles, magnified six times.
D.—Nut (golden brown, with dark wavy lines, flattened, the two edges smooth), with white, shiny, persistent style-base, and bristles, magnified six times.

South African Specimens Examined.—Schlechter 1823, Langebergen, Riversdale, 330 m. (named *R. fusca* Link in Herb. Schinz) ; Schlechter 5988, Storms River, 350 ft. ; MacOwan 1354, Howiesons Poort, near Grahamstown ; Glass 631, Coldspring, near Grahamstown ; Sim 2685, Fort Cuninghame ; Sim 2844, Dohne Hill ; Flanagan 2364, marshy places near Kei mouth ; Flanagan, Engcobo Mountain, 4400 ft. ; Dieterlen 766*a*, Leribe, 5-6000 ft. ; Buchanan 356, Natal ; Schlechter 2971, Clairmont, Natal, 50 ft. ; Wood 1596, Inanda ; Mogg 6829, Tweedie, 3650 ft. ; Mogg 6078, Melmoth, Zululand, 2100 ft. ; Mogg 6310, 6278, Amatikulu, Zululand, 50 ft. ; Galpin, Umlomati Valley, Barberton, 4000 ft. ; McCallum, New Agatha, Pietersburg District.

Distribution.—Common in nearly all tropical and warm-temperate regions. From tropical Africa only recorded in Nyassaland. In South Africa scattered in the southern coast districts from the Cape Peninsula eastwards, with a very wide range of altitudes.

CARPHA R. Br.

" This genus differs from *Schoenus* only by the lowest nut-bearing glume having the next glume close over it, not separated by an elongated curved joint of the rhachilla, as is the case in *Schoenus* " (Clarke in " Flora of Trop. Afr.," VIII, 483). In *Carpha glomerata* the hypogynous bristles (representing the perianth) vary. While they are usually as represented on Plate LX, I found in one case the inner twice the length of the ovary, the outer shorter than the ovary, and glabrous. This variability of the perianth is in agreement with what we find in *Fuirena*, *Ecklonia*, and other genera. There are twelve species described, all in the southern hemisphere (America, Africa, the Mascarene Islands, Australia). In tropical Africa there is only one species, found on Mt. Ruwenzori at an altitude of 10,000 ft., and in West Umsambara. In South Africa there are four species, all endemic, found in the southern coast districts, none going farther east than Pondoland. All are distinct hydrophytes.

Carpha bracteosa C. B. Cl. and *Carpha Schlechteri* C. B. Cl. are figured in "Plantae Novae vel minus cognitae Herb. Horti Thenensis," t. 9 and 10. (The perianth-bristles are wrongly placed in t. 10, 7.)

PLATE LX (MacOwan 651).

Carpha glomerata Nees.

"Flora Capensis," VII, 269; Clarke in "Illustr. of Cyp.," t. 76, 7–9; Marloth, "Flora of South Africa," IV, t. 10 E, and p. 39, fig. 7, 1–4.

A.—Upper portion of culm, half natural size.
B.—Floral glume, magnified five times.
C.—Gynaecium, with perianth, magnified five times.
D.—Nearly ripe nut, with persistent perianth, magnified five times. (Markings of nut as described by Clarke are extremely minute.)

Specimens Examined.—Ecklon and Zeyher, Clanwilliam; Ecklon and Zeyher 108 alongside a rivulet in the 2-degree altitude on the northern side of the Devil's Peak; Wolley Dod 2033, Wynberg Park; Tyson, Dal Josaphat; Bolus 4229, Grabouw, near Palmiet River, 700 ft.; Rehmann 2418, Brandvley, Worcester; Schönland 3086, about three miles from Haarlem towards Avontuur; Britten 1293, in shade of river-bank, occasional, Hofman's Bush, Zitzikama; Rogers 2930 and Galpin 4841, Humansdorp; Paterson 2478, Vanstadens; Paterson 835, Walmer; MacOwan 651, Glass 684, Daly and Sole 266, Schönland 760, in damp places on southern slopes of hills south of Grahamstown.

Distribution.—From Clanwilliam in the southern coast districts to Grahamstown.

Remarks.—This very showy species, often 5 ft. high, is frequently associated with the Palmiet (*Prionium serratum*).

ECKLONIA Steud.

"The structure of the spikelet and flower in this genus is so exactly that of *Carpha* that it might be better to sink the genus in *Carpha*" (Clarke in "Fl. Cap.," VII, 271). As it stands, it is restricted to the extreme south-west of South Africa. There are only two species known.

PLATE LXI (Schlechter 1566).

Ecklonia capensis Steud.

"Flora Capensis," VII, 271; Clarke in "Illustr. of Cyp.," t. 77, 4–9.

A.—Plant, natural size.
B.—Floral glume, magnified seven times.
C.—Flower, after anthers have dropped off, magnified seven times.
D.—Petal, enlarged.

Specimens Examined.—Schlechter 1566, in wet depressions near Wynberg; Bolus 2743, Kenilworth; Wolley Dod 3244, near Maitland Station; Wolley Dod 3129, streams beyond Camps Bay; Schlechter 9137, on mountains near Bains Kloof, 1700 ft; Zeyher (?) in Herb. S.A. Mus., Hottentots Holland.

Distribution.—Only known from the localities mentioned and from Table Mountain.

Remarks.—The petals seem to vary very considerably. As here drawn carefully, they are quite different from those represented by Clarke ("Illustr.," t. 77, 6). Boeckeler's description ("Linnaea," XXXVIII, 229) fits our drawing fairly well. Kunth ("Enum.," II, 287) describes them as "anguste lineares, apice trifidae, inferne villoso-ciliatae."

SCHOENUS L.

It is in this genus particularly that a cymose structure of the spikelet appears to occur (compare Celakowsky in "Ber. d.d. bot. Gesellschaft," V, 148, and various figures by Clarke in "Illustr. of Cyp.," t. 78–80). Some species have a perianth, while others lack it. Besides *S. nigricans*, there are fifty-eight species, one in Europe, one in North America, the remainder in Australia, of which a few extend to south-east Asia or South America.

The only South African species, *S. nigricans* L., is scattered in the southern coast districts, and is also found in Griqualand West; then it is absent until Somaliland is reached. It further occurs in Abyssinia, North Africa, western Europe to north-west India, the United States, and Surinam.

Plate LXII (Schlechter 1272).

Schoenus nigricans L.

"Flora Capensis," VII, 272; "Flora of Trop. Afr.," VIII, 484.

A.—Culm, half natural size.

B.—Floral glume, magnified five times.

C.—Young flower, magnified three times (perianth very minute).

D.—Gynaecium of older flower, with one of the "petals," magnified three times.

E.—"Petal," more highly magnified.

South African Specimens Examined.—Zeyher 1782, in boggy places, Cape Flats; Ecklon and Zeyher, Table Mountain; Moss 204, Schlechter 272, dunes, Muizenberg; Wolley Dod, 2535, Uitvlugt, near Capetown; Wolley Dod 3196, wet rocks, Hout Bay Fisheries; Paterson 2366, Walmer; Flanagan 916, along streams near Komgha.

Distribution.—See above under the genus.

Remarks.—In the specimens examined, two fertile flowers in each spikelet were found. The perianth varies considerably. In Schlechter 1272 it consisted of three longish glabrous scales and a few small ones more or less ciliate.

EPISCHOENUS C. B. Cl.

In the scanty material at my disposal I found (in accordance with Clarke's account) the three lowest glumes empty in the spikelet, then came two male flowers, then one bisexual flower. Above this the rhachilla is lengthened as in *Schoenus*. I have not seen the characteristic nut. There is no perianth. The stem is quadrangluar, with four deep grooves (at all events, in dried material). The genus is monotypic, and only found in the south-west coast region of South Africa, from Table Mountain to Riversdale.

PLATE LXIII (Schlechter 7204).

Epischoenus quadrangularis C. B. Cl.

"Flora Capensis," VII, 273; Clarke in "Illustr. of Cyp.," t. 88, 5–7.

A.—Plant, natural size.

B.—Two sterile glumes, magnified five times.

C.—Floral glume of fertile flower, magnified five times.

The flowers were too young to be drawn with advantage.

Specimens Examined.—Schlechter 7402, Houwhoek (Caledon), 2500 ft.; Schlechter 1765, Langebergen (Riversdale), *c.* 1300 ft.

COSTULARIA C. B. Cl.

This genus is only distinguished from *Tetraria* Beauv. by the fact that the male flower is below the female flower, but this character is also found in some species which Clarke placed under *Tetraria*. It has six or seven species found in Australia, the Mascarene Islands, and in South Africa two, the locality of one is not known. The latter was found by Carmichael, who collected in south-west Cape Province and Tristan d'Acunha, and was for some time stationed at Algoa Bay.

PLATE LXIV (Galpin 1316).

Costularia natalensis C. B. Cl.

"Flora Capensis," VII, 274.

A.—Plant, half natural size.

B.—Spikelet, magnified four times (with four empty glumes, then one male flower, then one bisexual flower).

C.—Floral glume, magnified five times.

D.—Bisexual flower, after the stamens were shed, magnified five times.

E.—Young stamen, magnified.

Specimens Examined.—Buchanan 354, Natal; Galpin 1316, Saddleback Mountain, Barberton.

Distribution.—Only known from the localities mentioned.

TETRARIA Beauv.

The members of this genus (incl. *Boeckeleria* Th. Dur. = *Decalepis* Boeck.) have all more or less a restiaceous habit, which is especially striking in some species, where the leafblade may not be developed (e.g. *T. punctoria* Nees). It is closely allied to *Epischoenus*, *Costularia*, and *Macrochaetium*, but also to some exclusively or preponderatingly Australian genera with similar habit, such as *Cyatochaeta* Nees, *Tetrariopsis* Clarke (Kew Bull., Add. Ser., VIII, 1908, 45), *Schoenus* L., and *Caustis* R. Br. Taking these genera together, their distribution offers a close parallel to that of *Restiaceae*. *Gahnia* seems to differ from *Tetraria* only by its spirally placed glumes, but there is a distinct tendency to spiral arrangement of the glumes in several *Tetrarias*: in fact, I do not know how *T. punctoria* and *T. MacOwani* can be separated from *Gahnia*. Thirty-three species are described in the "Flora Capensis," almost all of which are restricted to the south-west coast districts of south-west Cape Province. Only a few go farther east, none reaching Natal; but *T. circinalis* C. B. Cl. has also been found in East Africa (Usambara). After the publication of the seventh volume of the "Flora Capensis," Clarke has described a new species, *T. lucida* (Schlechter 9987, Prince Alfred), in Kew Bull., Add. Ser., VIII, 1908, 48, and in the same place also an Australian species, *T. australiensis* (found by Diels on the Serpentine River). Dissections of fifteen species are included in his "Illustr. of Cyp.," London, 1909. The rare *T. ferruginea* C. B. Cl. was figured by De Wildeman in "Plantae Novae vel minus cognitae Horti Thenensis," t. 11. *T. thermalis* was figured by Marloth in "Flora of S. Africa," IV, p. 39 (fig 5-10), and on t. 10.

Mr. Turrill agrees with me that the following represent undescribed species. Their descriptions will shortly be published :—

T. vaginata.—Koude Bokkeveld, 4000 ft., Sep., Schlechter 8886.

T. maculata.—Koude Bokkeveld, 4000 ft., Sep., Schlechter 8851 ; Koude Bokkeveld, Skurfdebergen, near Gydouw, 4500 ft., Jan., Schlechter 10003.

T. Galpinii.—Mountains, Bongola Nek, Queenstown, 5000 ft., Sep., Galpin 8228.

T. pubescens.—Mountains near Bains Kloof, 2000 ft., Feb., Schlechter 10250.

PLATE LXV. (Schlechter 5422).

Tetraria crinifolia C. B. Cl.

"Flora Capensis," VII, 277 ; Clarke, in "Illustr. of Cyp.," t. 89, 1–4.

A.—Plant, natural size.

B.—Male spikelet, magnified three times.

C.—Male flower, with its glume, magnified three times.

Specimens Examined.—Schlechter 5422, Palmiet River, 900 ft. ; Schlechter 7469, Tulbagh, 2000 ft. ; Drege, at the Tulbagh Waterfall ; Ecklon and Zeyher (?), Zwartcberg Mountain, Caledon.

Distribution.—Known only from the localities mentioned.

Remarks.—This plant is described as monoecious, but no female spikelets were found on the specimen figured. The male flower is described as having three stamens, but flowers with four or five stamens occur. The style has a very large persistent base.

PLATE LXVI (MacOwan 1954).

Tetraria cuspidata C. B. Cl.

"Flora Capensis," VII, 277 ; Clarke in "Illustr. of Cyp.," t. 89, 5–8.

A.—Plant, natural size.

B.—Spikelet, magnified five times.

C.—Glume of bisexual flower, magnified ten times.

D.—Bisexual flower, with one anther shed, magnified ten times. This shows gradual ripening of stamens.

Specimens Examined.—Schlechter 8756, Koudeberg, near Wupperthal, Clanwilliam 3600 ft. ; Wolley Dod 2134, by reservoir, Newlands Wood ; Wolley Dod 1366, near tunnel Kasteel Poort ; Wolley Dod 2700, Schoester's Kraal, Cape Peninsula ; Drege, Simonstown near Waterfall, 2000 ft. ; Zeyher 4426, Lion's Rump ; Bolus 4861, amongst heaths, east side of Devil's Peak, 500 ft. ; Dummer in Herb. S.A. Mus. 12623, mountain slopes round Stellenbosch ; Zeyher 4431, hills, Hartebeest River, Caledon ; Schlechter 7284, Sir Lowrys Pass, 1500 ft. ; Schlechter 7656, Elim, 500 ft. ; Schlechter 10295, mountains near Genadendal, 3000 ft. ; Schlechter 7404, Houwhoek, 2000 ft. ; Schlechter 10343, Zwartberg, beyond Sandfontein, 2000 ft. ; Zeyher 4432, in mountains above Voormansbosch, Swellendam ; Rogers 2809, 2811, Assegaibosch, 900–1000 ft. ; Rogers 2931, Humansdorp ; Zeyher 4430, Vanstadens Mountain (this is named *Elynanthus loreus* Nees, and is evidently a co-type, but the spikelets are as in typical *T. cuspidata*, except that the lowest glumes have short cusps; the flowers are very young); Paterson 2367, Walmer; Paterson 1103, Humewood; Galpin 6388, Riverside, Earncliff, near Port Elizabeth; Kemsley 248, Port Elizabeth; Daly 823, Rockcliffe, near Sidbury; Bennie 335, Goodwins Kloof, Grahamstown; Daly and Sole, 232, 258, Coldstream, near Grahamstown; Bolus 2585, amongst grasses, Koudeberg, Sneeuwbergen, 5500 ft.; MacOwan 1954, amongst grass, top of Boschberg, 4500 ft.; Rattray 69, summit of Gaikaskop, 6000 ft.; Sim 2840, Pirie; Sim 1331, Mt. Coke; Flanagan 1786, Amalinda, near East London, 500 ft.; Flanagan 926, pastures near Kei mouth, 200 ft.; Galpin 2877, Port St. Johns, 1000 ft.

Distribution.—From Clanwilliam to St. Johns in the coast districts, also on a few mountains farther inland. I have also a specimen, Rogers 2572*a*, which is marked "Witbank, Transvaal," but I suspect a mistake here.

Remarks.—The specimens enumerated probably belong to one species, although, unfortunately, a number of them have only undeveloped flowers. In a few which had nuts the style-base was always decurrent on the angles of the nuts. There are variations in the spikelets and flowers, but I doubt whether these can be used to distinguish even well-marked varieties. Clarke distinguishes a var. *lorea* (*Elynanthus loreus* Nees) with "lower empty glumes hardly shorter than the nut-bearing glume, very acute or mucronate, the lowest bractlike, aristate"; but with these characters, which certainly occur in extreme cases, I cannot divide the specimens satisfactorily. The chief distinctions of *E. loreus* Nees, as stated by the author in "Linnaea," X, 188, are: "Leaves linear, flat"; "nut rostrate through the persistent narrow subulate style-base"; while in *E. cuspidatus* the leaves are "filiform-subulate terete," "the nut has a hispid rostrum." I have not seen a specimen with flat leaves. Boeckeler says ("Linnaea," XXXVIII, 257):—

> *E. loreus:* "Caryopsi ellipsoidea trigona, angulis obtusis prominentibus, cancellata fuscescenti-straminea, stylo validulo basi vix parum incrassata fimbriato coronato."
>
> *E. cuspidatus:* "Caryopsi elongato-obovata trigona tricostata cancellata stramines, rostro concolorato conico ad angulos fructus decurrente; stylo trifido vix parum exserto."

But even this does not help me—e.g. in Bennie 335 the style is split to the thickened hispid base; in Rattray, which has a similar thickened base, the unthickened part is rather long, while in MacOwan 1954 the style-base is little thickened and glabrous. It must be left to future investigations to bring order into this apparent chaos. However, there are several numbers quoted by Clarke in "Fl. Cap.," VII, 278, which have only been inadvertently admitted under *T. cuspidata*: Schlechter 7825 (=Schlechter 440, 9964, named by Clarke in Herb. Bolus *T. Dregeana* C. B. Cl., though none agree with the original description of the spikelets and glumes of *Elynanthus Dregeanus* Boeck.); Schlechter 7341 (=Schlechter 8812, = Bolus 4230, which are all *T. Bolusii* C. B. Cl.); Bolus 4742 (which is *T. sylvatica* C. B. Cl.).

PLATE LXVII (Schlechter 10435).

Tetraria sylvatica C. B. Cl.

"Flora Capensis," VII, 279; Clarke in "Illustr. of Cyp.," t. 90, 5–6.

A.—Plant, natural size.

B.—Spikelet, magnified three times.

C.—Floral glume, magnified five times.

D.—Bisexual flower, magnified five times.

Specimens Examined.—Wolley Dod 2787, above Camps Bay, under 300 ft.; Wolley Dod 3832, near Noah's Ark Battery; Wolley Dod 2553, rocks by Smitwinkel Bay; Wolley Dod 2798, Redhill, near Simonstown (this, according to Clarke in Herb. Bolus, shows that

T. aurita is only a small form of *T. sylvatica*) ; Bolus 4742, top of Table Mountain, 3500 ft. Schlechter 7385, Houwhoek, 2500 ft. ; Schlechter 10435, hills beyond Papiesvley, 700 ft. ; Schlechter 7922, Vogelvley, 2000 ft. ; Schlechter 7516, Tulbagh, 600 ft. ; Schlechter 7655. in sandy places, Elim, 500 ft. ; Zeyher, Tulbagh Kloof ; Zeyher, Olifantshoek.

Distribution.—Hills of south-west Cape Province and at Olifantshoek (Alexandria Division).

Remarks.—Like Boeckeler and Clarke, I cannot distinguish *Elynanthus auritus* Nees from this species, but I cannot help thinking that with fuller material it will be seen that what we call *T. sylvatica* is composed of at least two species. In some the leafsheaths are coriaceous, in others membranous. Further, the leaves vary very much in width. There is a close relationship with *T. cuspidata*, which is placed by Clarke in a separate section of *Tetraria*, and even in a separate genus by many cyperologists. Two spikelets were dissected from Zeyher's specimens collected in the Olifantshoek. Each of them was one-flowered (as is usually the case in *cuspidata*) ; the flowers were bisexual ; the gynaecium was young, but as in typical *T. sylvatica*.

PLATE LXVIII (Schlechter 9731).

Tetraria thermalis C. B. Cl.

" Flora Capensis," VII, 285 ; Clarke in " Illustr. of Cyp.," t. 91, 4–7.

A.—Upper portion of culm, half natural size.

B.—Floral bract, twice natural size.

C.—Bisexual flower, twice natural size.

Specimens Examined.—Wolley Dod 2678, by Wynberg Reservoir ; Bolus 4717, lower plateau, Table Mountain, 2400 ft. ; Schlechter 9731, mountain beyond Koude River, 800 ft. ; Ecklon and Zeyher, Stellenbosch, 2000–4000 ft. ; Zeyher, near Caledon hot springs.

Distribution.—Mountains of the south-west Cape Province from the Cape Peninsula to the Riversdale Division.

Remarks.—In the flower drawn on this plate the style-branches are not properly developed. They are normally much longer. There were two flowers in each spikelet, the lower with rudimentary gynaecium, the upper distinctly bisexual. The ovary and base of style were minutely white-scabrous.

PLATE LXIX (Flanagan 2303).

Tetraria MacOwani C. B. Cl.

" Flora Capensis," VII, 290 ; Clarke in " Illustr. of Cyp.," t. 93, 5–8.

A.—Plant, natural size.

B.—Floral glume, magnified three times.

C.—Bisexual flower, magnified three times.

Specimens Examined.—Schlechter 10078, Koude Bokkeveld, mountains beyond Wagedrift, 5800 ft. ; MacOwan 1864, rocky places, top of Boschberg, 4800 ft. ; Sim 2842, Pirie ; Flanagan 2303, grassy slopes near Toise River Station, 3500 ft. ; Hepburn 345, Herschel District.

Distribution.—Chiefly on the mountains of eastern Cape Province, but also on the Cold Bokkeveld.

Remarks.—In this and in *T. punctoria* the glumes of the spikelet are more distinctly spirally arranged than in other species of *Tetraria.* The structure of the spikelets and of the flowers is not uniform. In Sim 2842 I found in some spikelets only a bisexual flower (apparently terminal), and in others, in addition, a rudimentary flower below it. The number of stamens were nine or ten, not ripening together. In Flanagan 2303 I found three flowers in one spikelet, a bisexual flower apparently terminal, below this a bisexual flower with smaller but well-developed gynaecium (evidently also fertile), and below this a male flower with very rudimentary gynaecium. In the two upper flowers I counted five stamens and five style-branches. Hepburn 345 has smaller spikelets than the other specimens mentioned.

MACROCHAETIUM Steud.

The distinctly spirally imbricate glumes of the spikelet enable one to distinguish this genus easily from *Tetraria, Costularia,* and *Carpha.* The distribution of the flowers in the spikelet is as in *Tetraria* sect. *Hemischoenus.* It has, however, six stamens, six perianth-bristles, and a persistent style-base.

The genus is monotypic, and found in the south-western coast districts as far as Vanstadens. At first sight it might be taken for one of the *Restiaceae,* with the brown sheaths of its bracts in the floral region.

Plate LXX (MacOwan 1954).

Macrochaetium Dregei C. B. Cl.

" Flora Capensis," VII, 271 ; Clarke in " Illustr. of Cyp.," t. 81, 4.

A.—Plant, natural size.

B.—Floral bract, magnified five times.

C.—Bisexual flower, after the anthers have been discarded, magnified five times.

D.—Nut with persistent style-base, magnified five times.

Specimens Examined.—Wolley Dod 3289, Steenberg Plateau; Schlechter 10280 mountains near French Hoek, 2000 ft. ; Ecklon and Zeyher, Grootvadersbosch ; Ecklon and Zeyher 90, in damp places in the Voormansbosch ; Zeyher 4434, grassy damp places on the mountains above Voormansbosch ; Fourcade 1007*a*, Flats, Witte Els Bosch ; MacOwan 2090, rocky places, Vanstadens Mountains, 2000 ft.

CLADIUM P. Br.

This genus is closely allied to *Macrochaetium,* from which it is distinguished by the smaller number of stamens. Hypogynous bristles occur in some species. Besides the one cosmopolitan species found in South Africa, and which is also the only one in tropical Africa, there are over forty species, mostly insular or near the sea, scattered throughout the warmer parts of the globe.

Plate LXXI (MacOwan 1106).

Cladium jamaicense Crantz Inst. 1, 362.

C. mariscus R. Br., " Flora Capensis," VII, 291 ; *C. jamaicense* Crantz, " Flora of Trop. Afr.," VIII, 484 ; Clarke, " Illustr. of Cyp.," t. 82, 7–8.

A.—Upper portion of culm, half natural size. (The artist in making the drawing has bent the specimen : in nature the main axis of the inflorescence is nearly straight.)

B.—Spikelet, magnified.

C.—Floral glume, magnified five times.

D.—Bisexual flower, magnified five times.

South African Specimens Examined.—Wolley Dod 2363, Retreat Vley ; Drege 1840, without locality ; Ecklon and Zeyher, in boggy places, dunes, Cape Flats ; Drege, MacOwan 1106, Vanstadens River ; J. L. Drege 142, Port Elizabeth ; Mogg 6032, Mtunzini, Zululand, 157 ft.

Distribution.—Besides the localities mentioned, it has been recorded in South Africa from Natal, Griqualand West, Bechuanaland, and the Transvaal, but it seems always to be very local.

CHRYSITHRIX L.

This genus stands quite isolated amongst South African *Cyperaceae.* Its nearest ally is the Australian genus *Chorizandra* R. Br. Clarke, in the "Flora Capensis," VII, 292 and 760, records three species, all restricted to south-west Cape Province (one goes as far as the Uitenhage Division). He has also described an Australian species (*C. distigmatosa* C. B. Cl.). The genus belongs to the suborder *Mapanieae,* of which two genera, widely spread throughout the tropics, are found in tropical Africa. The terminal structure bearing the sexual organs was at one time looked upon as a single flower, but it is now generally considered a spikelet bearing a single terminal flower surrounded by one-staminate flowers.

H. Pfeiffer has recently (in "Ber. d.d. bot. Ges.," XXXVIII, 1920, p. 6) tried to show that *Chrysithrix* and allied genera should be removed from *Cyperaceae* and placed amongst *Restiaceae.* He based his conclusion—

(1) On the fact that the leafsheaths are not closed, but this is found in other undoubted Cyperaceae.

(2) On the supposed fact that the ovule is pendulous. As far as *Chrysithrix capensis* is concerned, I can say for certain that the structure of the ovary and the position of the ovule is exactly as in other Cyperaceae, although Pfeiffer says that in this species and in *Chorizandra sphaerocephala* it is distinctly pendulous. I have had no opportunity of examining *Chorizandra.*

(3) On the position of the embryo, which, according to him, lies by the side of floury endosperm. This seems to be also based on faulty observation, though I cannot be quite positive as regards the position of the embryo, as I have only had one ripe nut at my disposal, and I did not at once fix my attention on this point when dissecting it.

(4) On the reduction of the leaves to sheaths. This is only exceptional in *Chrysithrix,* and occurs in numerous other *Cyperaceae.* It cannot be looked upon as a purely restiaceous character.

(5) On anatomical grounds. These, to say the least, are by themselves not convincing.

Pfeiffer in his paper ignores the relations of *Chrisithrix* to *Mapania* and its nearest allies. He ignores most important characters common to all *Restiaceae,* and not found in any of the *Mapanieae,* but enough has already been said to show why we cannot follow him in removing *Chrysithrix* to this order.

PLATE LXXII (Wolley Dod 3053).

Chrysithrix capensis L.

"Flora Capensis," VII, 293; Clarke in "Illustr. of Cyp.," t. 120, 1–11; Marloth, "Flora of South Africa," IV, 45, t. 10 D., fig 7c, 1–3 (placentation wrongly represented in 1).

A.—Plant, natural size.
B.—Male flower, with floral glume, twice natural size.
C.—Female flower, twice natural size.
D.—Style and stigmata, magnified five times.

E.—Thickened portion of style, to show grooves, more highly magnified.

F.—Ovary opened to show the basal anatropous ovule, magnified fifteen times.

G.—Nut, magnified four times.

Specimens Examined.—Zeyher 4424, damp places, Cape Flats, and on top of Table Mountain; Wolley Dod 3053, lower plateau, Table Mountain; Wolley Dod 1254, Smitswinkel Bay; Wolley Dod 1257, beyond Kenilworth Reservoir; Phillips, 4076, damp ground on lower plateau above Smitswinkel Bay.

Var. *subteres*: Rogers 11034, Steenbras, Caledon Division; Wolley Dod 2703, near Chapmans Peak, over Nordhoek, 2000 ft.; Wolley Dod 3547, upper part of Silvermine Valley; Ecklon and Zeyher, mountains near Swellendam (one specimen approaches closely the type of *C. Dodii* C. B. Cl.); Galpin 4839, Cradockberg, near George.

Distribution.—South-west Cape Province from the Cape Peninsula to George. "Not infrequent in the south-western mountains, though often overlooked" (Marloth).

Remarks.—I have not seen sufficient material to form a final opinion on the limits of the species in this genus, but I am inclined to separate typical *C. capensis* and place the two others with *C. capensis* var. *subteres* into a second species. *C. Dodii* C. B. Cl. is known to me from—

Wolley Dod 3550, lower plateau, over Skeleton Gorge, Table Mountain; Wolley Dod 3549, Silvermine Valley; Galpin 4840, Cradockberg, near George, 1500 ft.; Schlechter 1916, Langebergen, near Riversdale, 1500 ft.

C. junciformis Nees was described in "Linnaea," X, 144, from specimens found by Ecklon and Zeyher on the Elands River, Uitenhage. It is efoliate, the culms only bearing mucronate sheaths at their base (Clarke in "Fl. Cap.," VII, 293, says "leaves terete"). I have not seen a type. In Galpin 4840, quoted by Clarke under *C. Dodii*, there are efoliate culms as well as others like those of typical *C. Dodii*.

SCLERIA Berg.

In this genus the flowers are all unisexual, the spikelets unisexual (e.g. *S. melanomphala*) or bisexual (e.g. *S. hirtella*), in the latter case with the lowest flower female as in *Schoenoxiphium*. The ovary often has a more or less conspicuous disc at its base. The culms are leafy. The leafsheaths in some species have a distinct ligulate extension opposite the blade. The bony nut serves as a useful guide to distinguish this genus.

There are about 160 species in all subtropical and tropical regions, except the Mediterranean and Orient. In the "Flora Capensis," eleven species are recorded, to which probably a couple of others have to be added for South Africa. None of them go west of Grahamstown, and most of them are only found in the east and north east. Three are endemic. One is found also in Madagascar. The remainder are also found in tropical Africa (two of these also in Madagascar).

Sc. Dieterlinii Turrill is mentioned by Phillips in his account of the "Flora of the Leribe Plateau," Ann. S.A. Mus., XVI, 328. It is not known to me.

Plate LXXIII (Flanagan 2363).

Scleria hirtella Swartz.

"Flora Capensis," VII, 294.

A.—Plant, natural size.

B.—Floral glume of female flower, magnified eight times.

C.—Female flower, magnified eight times.

D.—Stamen, magnified eight times.

Specimens Examined.—Flanagan 2363, marshy places near Kei mouth; Burke 62, boggy places on the Magaliesberg.

Distribution.—Tropical Africa, Madagascar, America; in South Africa, in the eastern coast districts and Transvaal.

Remarks.—Flanagan 2363 is so near *S. catophylla* C. B. Cl. ("Flora Capensis," VII, 294, and Clarke, "Illustr. of Cyp.," t. 122, 1-4) that I doubt whether the latter can be kept separate. Is, however, our *S. hirtella* the same plant as found in America? Unless the specimens I have from America are wrongly named, this is not the case. I have seen the following referable to *S. catophylla* C. B. Cl.:—

Glass 574, Coldspring, near Grahamstown; Wood 1428, damp places, Clairmont, Natal (Wood has also distributed *S. angusta* under this number); Pole Evans, Graskop; Rogers 10787 (without locality); Schlechter 4120, in boggy places near Bergspruit, Transvaal.

Plate LXXIV (Mogg 5806).

Scleria melanomphala Kth.

"Flora Capensis," VII, 296; "Flora of Trop. Africa," VIII, 506.

A.—Plant, half natural size.
B.—Floral glume of male flower and one young anther, magnified five times.
C.—Floral glume of female flower and female flower, magnified five times.
D.—Fruiting spikelet, magnified six times.
E.—Base of nut from one of the flattish sides, magnified six times.
F.—Base of nut from the two narrower sides, magnified six times.
G.—Nut seen from below, magnified six times.

Specimens Examined.—Glass 573, Coldspring, near Grahamstown; Flanagan 988, marshy places near Komgha, 1200 ft.; Pegler 322, Kentani (damp places in veld); Tyson 2814, St. Andrew's Mission Station, Pondoland, 1000 ft.; Schönland 3949, 4190, damp places near sea-level, Port St. Johns; Wood 1597, Inanda; Mogg 5806, Zululand, 150 ft.

Distribution.—Scattered in the south-eastern coast districts from Grahamstown eastwards, also in tropical Africa and the Mascarene Islands.

ERIOSPORA A. Rich.

This genus is only distinguished from *Scleria* by the numerous bristles at the base of the ovary. Clarke, in "Flora of Trop. Afr.," VIII, 511, remarks on the extraordinary resemblance of the leaves of this genus to those of grasses: "They are equitant, more or less distichous, deeply split on one side, with a ring of white hair entirely simulating the ligule of grasses at the mouth." In *E. pilosa* he even describes a "short-ovate ligule" as found in most *Sclerias*. The genus is scattered through tropical Africa (five species) and Madagascar; only one species is found in South Africa which is endemic in the Transvaal.

Plate LXXV (Paterson).

Eriospora Rehmanniana C. B. Cl.

"Flora Capensis," VII, 297; Clarke in "Illustr. of Cyp.," t. 140, 5-8.

A.—Culm, natural size.
B.—Spikelet, magnified five times.
C.—Floral glume, magnified five times.
D.—Young female flower, magnified five times.
E.—Young stamen, magnified five times.

Specimen Examined.—Paterson, Johannesburg.

Distribution.—Known from the Houtbosch, Pretoria, and Johannesburg only.

Remarks.—The spikelets have one female flower and above it one or two male ones, with three stamens.

SCHOENOXIPHIUM Nees.

I take this genus as defined by Kükenthal (*Cyperaceae—Caricoideae* in Engler, "Das Pflanzenreich," IV, 20, 1909, p. 28). It includes eight species, almost all endemic in South Africa (only *Sch. sparteum* var. *Schimperianum* being also found in East Africa and Abyssinia, and var. *Lehmannii* also in East Africa).

1. *Sch. lanceum* (Thunb.) Kük. = *Sch. capense* Nees, "Flora Cap.," VII, 299.
2. *Sch. rufum* Nees, "Flora Cap.," VII, 298.
    Var. *β Dregeanum* (Kth.) Kük. = *Sch. Dregeanum* Kth. and *Sch. rufum, partim,* "Flora Cap.," VII, 298.
3. *Sch. Buchanani* C. B. Cl. = *Carex Buchanani* C. B. Cl., "Flora Cap.," VII, 305.
4. *Sch. caricoides* C. B. Cl., in Kew Bull., Add. Ser. VIII, 1908, 67 = *Sch. Kunthianum* Kük. = *Carex Dregeana* Kth. (incl. var. *major*), "Flora Cap.," VII, 303.
5. *Sch. sparteum* (Wahlenb.) Kük. = *Carex spartea* Wahlenb. in "Fl. Cap.," VII, 304.
    Var. *β Schimperianum* (Boeck.) Kük. = *Carex Schimperianum* Boeck., "Flora Cap.," VII, 518, *partim,* and *C. Bolusi* C. B. Cl., "Flora Cap.," VII, 304.
    Var. *γ Lehmannii* (Nees) Kük. = *Carex Esenbeckiana* Boeck., "Flora Cap.," VII, 304.
6. *Sch. Ecklonii* Nees, *partim* = *Carex Zeyheri* C. B. Cl., "Flora Cap.," VII, 303.
    Var. *β unisexuale* Kük. = *Carex bisexualis* C. B. Cl., "Flora Cap.," VII, 302.
7. *Sch. filiforme* Kük., in Kew Bull., 1910, 129 (Galpin 5605, under rocks, summit of Winterberg, 7700 ft.).
8. *Sch. basutorum* Turrill (Ms ?) = Dieterlen 948 in Herb. S.A. Mus., Leribe Plateau (an *Sch. Ecklonii* forma ?). Quoted by Phillips in "Ann. S.A. Mus.," XVI, 329.
    (Clarke also includes in the genus *Sch. fragile* = *Kobresia fragilis* C. B. Cl., from China.)

The characters distinguishing *Schoenoxiphium* from allied genera show themselves only in androgynous lateral spikelets. If these are reduced to the female flower, as happens most frequently, especially in *Sch. sparteum* and *Sch. rufum,* there is no character except the incompletely closed utricle to distinguish it from *Carex,* and since the utricle splits very easily in *Carex,* even this character is very elusive. Moreover, in *Carex* androgynous lateral spikelets also occur, though only as abnormalities. The distinction from *Kobresia* (found in the northern hemisphere only, chiefly in Asia) is even smaller. In this genus androgynous lateral spikelets occur frequently, but the rhachilla is inconspicuous, while in *Schoenoxiphium* it is elongated and flattened.

It is interesting to note that Kükenthal looks upon *Schoenoxiphium* as the starting point of the group of genera of *Cypcraeeae*, which, besides those mentioned above, includes *Uncinia*, l.c., p. 24; see also Clarke, "On *Hemicarex* and its Allies," Journ. Linn. Soc., XX (Bot.), 374]. The genus as defined by Kükenthal is found, in South Africa, in the southern coast districts from Capetown to Natal, but also on some of the eastern mountains farther inland, in the Orange Free State, and the Transvaal. It grows often amongst grass.

Marloth, in "Flora of S. Africa," IV, fig. 7c, 4–5, figures a pseudo-spikelet and a reduced female spikelet of *Sch. lanceum*.

Plate LXXVI (Flanagan 915).

Schoenoxiphium rufum Nees, β *Dregeanum* (Kth.) Kük.

Kükenthal in "Pflanzenreich," IV, 20, 30; *Sch. Dregeanum* Kth., "Flora Capensis," VII, 298.

A.—Plant, half natural size.

B.—Lateral spikelet, opened out, showing utricle, female flower, elongation of axis, and male flowers, magnified five times.

C.—Utricle.

Specimens Examined.—*a typicum*: Galpin 2191, Umbombola Range, Queenstown, 4–4400 ft.; Galpin 2546, mountains, Finchams Nek, 4300 ft.; Hepburn 123, Majuba Nek, Herschel District.

β Dregeanum: MacOwan 1616, 1866, in woods on the Boschberg, 4500 ft.; (?) MacOwan 1474, damp shady places, Howiesons Poort, near Grahamstown; Flanagan 915, marshy places near Komgha, 1800 ft.

Distribution.—The type is recorded from a number of localities in south-eastern South Africa, ranging from Port Elizabeth to Durban, and in the mountains to the Orange Free State; the var. *Dregeanum* from south-east Cape Province only, a third variety, *pondoense* Kük. (Bachmann 116), from Pondoland, is unknown to me.

Remarks.—*Sch. rufum* is a very puzzling species, even if we admit that *Sch. Dregeanum* should be united with it. MacOwan 1866 (= 1616) is quoted by Clarke under *Sch. rufum*, while Kükenthal quotes it under his var. *Dregeanum*. This may indicate that it is not possible to draw a sharp line even between the varieties. Amongst MacOwan 1866 there are specimens which are quite devoid of androgynous lateral spikelets. The structure of the pseudo-spikelets is in these very much the same as those of *Carex zuluensis* (= *C. condensata* C. B. Cl. non Nees), and, in fact, taken by themselves, they would be placed either as a variety of *C. zuluensis* or very close to it as a species. The specimens of MacOwan 1471 which I have seen have no androgynous lateral spikelets at all. I am afraid that only by growing the plants can a satisfactory solution of this difficulty be arrived at. According to a note by the late Dr. MacOwan, Boeckeler named his No. 1866 *Carex Wahlenbergiana* Boott., a species which Kükenthal only records from the Mascarene Islands. Clarke figures *S. rufum* from Drege's specimens in "Illustr. of Cyp.," t. 141, 1-6, and Kükenthal illustrates the rhachilla of the partial androgynous spikelet (l.c., fig. 6 H.), but it is quite different from Clarke's figure 3.

Plate LXXVII (Galpin 6879).

Schoenoxiphium sparteum (Wahlenb.) Kük.

Kükenthal in "Pflanzenreich," IV, 20, 31; *Carex spartea* Wahlenb., "Flora Capensis," VII, 304; *C. Schimperiana* Boeck., "Flora of Trop. Afr.," VIII, 518 (*partim*); *C. Bolusi* C. B. Cl., "Flora Capensis," VII, 304.

A.—Plant, natural size.

B.—Portion of inflorescence representing a pseudo-spikelet, with a male spikelet at base and apex and reduced female spikelets in between (Tyson 586).

C.—Bract of reduced female spikelet, magnified eight times.

D.—Female flower, magnified eight times.

E.—Utricle enclosing female flower, magnified eight times.

F.—Utricle enclosing nut, magnified eight times.

Specimens Examined.—*α typicum*: Schlechter 2239, on the flats near George; Schönland 3557, Knysna Heads, amongst grass, 50–280 ft.; Daly 916, above the Grey Reservoir, Grahamstown; Rogers 3198, Grahamstown; Daly 634, 709, Trapps Valley; Rattray 846, East London; Flanagan 905, 906, 907, valleys near Komgha, intermixed with taller grasses, 2000 ft.; Pegler 1196 (p. pte.), damp soil, valley along forest clearing, Kentani, 1200 ft.; Tyson 1824, amongst rocks, Kokstad, 5000 ft.; Tyson 586, river banks, Vleyplaats, near Murraysburg, 4000 ft.; Galpin 6879, summit of Doodmanskrantz Mountain (Drakensberg), *c.* 9650 ft.; Bolus 8270, Besters Vlei, near Witzies Hoek, Orange Free State, 5400 ft.; Dieterlen 393, Leribe, Basutoland; Burtt-Davy 929, Standerton; Beeton 142, Wakkerstroom, 6200–7000 ft.; Bolus 12423, amongst grass in the high veld near Wonderfontein Railway Station, *c*, 6000 ft.; Bolus, Sheba Mountain, near Barberton.

β Schimperianum (Boeck.) Kük.: Bolus 1974, amongst rocks under krantzes, Compassberg, 5–600 ft. below top; MacOwan 1622, in woods on the Boschberg, 4000 ft.; Hutton 1581, Fish River Randt, near Fort Brown; Hutton 40, Port Alfred; Rattray 298, Hogsback; Hutton 1026, Kabousie; Flanagan 908, in woods near Komgha; Pegler 1098, near streams in soft masses, Kentani, 1000 ft.; Drege, near the Bashee, 1–2000 ft.; Schlechter 3176, near Krantzkloof, Natal, 1500 ft.

γ Lehmanni (Nees) Kük.: Ecklon and Zeyher, near Constantia; Moss 203, Skeleton Gorge, near Kirstenbosch; Schönland 3592, damp places, Knysna Forest; MacOwan 183, 1206, near Grahamstown; Daly 595, Trapps Valley; Rattray 353, in forests, Hogsback; Rogers 12831, Stutterheim; Galpin 6880, in wooded kloof, Potriverberg, Maclear District, 5800 ft.; Pegler 1097, edge of stream in forest, Kentani, 1000 ft.; Moss and Rogers 300, The Downs, Pietersburg District, Transvaal.

Distribution.—Mainly in south-eastern South Africa, but penetrating into the south-west coast region as far as the Cape Peninsula. The var. *β* is also found in East Africa and Abyssinia; var. *γ* also in East Africa.

Remarks.—While it may be justified to unite all the above under one species, as Kükenthal has done, it might have been best to have left it under the genus *Carex*. In the diagnosis Kükenthal says ("Pflanzenreich," IV, 20, 32): "Spiculae partiales 7 laterales androgynae vel (idque saepius) uniflorae foemineae." Now, in the first place, these female spikelets are very common indeed. As a rule, they are associated with purely male flowers arranged in spikelets, and very often one finds pseudo-spikelets with female flowers at the base and male flowers at the top, exactly as in the so-called androgynous spikelets of innumerable *Carices*. A true lateral androgynous spikelet of *S. sparteum* is illustrated by Kükenthal (l.c., fig. 6 1, K).

CAREX L.

This large genus is almost cosmopolitan, preferring, however, mountainous regions in tropical countries. It embraces about 800 species. Clarke, in "Flora Capensis," VII, records twenty-two species for South Africa. Kükenthal, in "Pflanzenreich," IV (20), removed seven of these to *Schoenoxiphium*, and records the following species for South Africa:—

1. *C. divisa* Huds.—Western region and Drakensberg (?); sandy spots, especially near the sea, in Europe and Asia; introduced in New Zealand.
2. *C. glomerata* Thunb.—Endemic. (Hardly distinguishable from the following, to which I refer it as a variety.)

3. *C. vulpina* L.—South Africa, Canary Islands, North Africa, Europe, Asia.
4. *C. spicato-paniculata* C. B. Cl.—South Africa, East Africa.
5. (*C. Huttoniana* Kük. = *C. condensata* C. B. Cl. non Nees) = *C. zuluensis* C. B. Cl.—South-eastern South Africa, Orange Free State, Nyassaland.
6. *C. cernua* Boott., *γ austro-africana* Kük. = *C. phaeota* C. B. Cl. non Spreng.—Orange Free State, Transvaal, Natal. The type in south and east Asia. Another variety in Australia and New Caledonia.
7. *C. petitiana* A. R. Rich.—South-east Cape Province, Natal, and Abyssinia.
8. *C. aethiopica* Schkuhr.—Cape Peninsula to Grahamstown ; endemic.
9. *C. Burchelliana* Boeck.—Griqualand West ; endemic.
10. *C. Oederi* Retz, *γ cataractae* (R. Br.) Kük. = *C. flava* Benth. non L.—Mont aux Sources. This variety also in Tasmania, New Zealand, Chile, and Patagonia ; the other varieties widely spread in the northern hemisphere.
11. *C. extensa* Good and var. *Ecklonii* (Nees) Kük. = *C. extensa* C. B. Cl.—The variety only at Port Elizabeth and in Scotland. The type from Port Elizabeth to Natal, and widely spread in Europe and North Africa.
12. *C. cognata* Kth.—Swellendam, George, Natal, Delagoa Bay, East Africa. *β drakensbergensis* (C. B. Cl.) Kük. = *C. drakensbergensis* C. B. Cl.—Drakensberg, Griqualand East, Transvaal.
13. *C. acutiformis* Ehrh.—Occasional in South Africa ; almost cosmopolitan, but absent from tropical Africa.
14. *C. clavata* Thunb.—Widely spread in South Africa, except in the interior parts and the west ; endemic.

There are four endemic species in South Africa (or only three if we drop *C. glomerata*). It will be seen that there is hardly any direct connection in this genus with the flora of tropical Africa (which includes twenty-eight species) ; a rather significant phytogeographical fact, though it must be taken in conjunction with other facts which cannot be thoroughly discussed here. I will only mention that, e.g., *C. aethiopica* Schkuhr. is closely allied to several tropical African species and others from the Mascarene Islands, Tristan d'Acunha, and south-west Europe. Compare also the remarks under "*Schoenoxiphium.*"

C. clavata was figured by Marloth in "Flora of South Africa," IV, p. 39.

PLATE LXXVIII (MacOwan 115).

Carex vulpina L.

"Flora Capensis," VII, 301 ; Kükenthal in "Pflanzenreich," IV (20), 168, fig. 27, A-C (including *C. glomerata* Thunb.).

A.—Plant, natural size.

B.—Female flower, with nearly ripe yellow nut, magnified ten times.

C.—Female flower enclosed in utricle, magnified ten times.

South African Specimens Examined.—a typica : Wolley Dod 3492, Raspenberg Vley Cape Peninsula (named *C. glomerata* by Clarke in Herb. Bolus) ; MacOwan 115, 1347, and Daly and Sole 170, near Grahamstown ; Daly 800, Sidbury ; MacOwan, Somerset East ; Hepburn 293, Sterkspruit, Herschel District ; Galpin 5602, Upper Zwartkei, 5000 ft. ; Flanagan 2795, Bolus 10361, near Nqamakwe ; Schlechter 6286, Bashee, 2800 ft.

β glomerata.—Schlechter 10070, Koude Bokkeveld, 5000 ft. ; Zeyher 187, 4446, Zwartkops River ; Hilner 136, four miles west of Kingwilliamstown ; Sim 2832, Dohne Hill ; Pocock 93, Burghersdorp ; Mogg 17497, Molteno ; Baur 823, Shiloh, 3500 ft. ; Bolus 10493 (Herb. Austr. Afr. 163), in moist ground, Elandshoek, near Aliwal North ; Dieterlen 758, Leribe ; Schlechter 6319, Ingunga, 3000 ft.

Distribution.—This species occurs almost throughout Europe, Asia, North Africa, the Canary Islands, and the southern coast districts of South Africa (but absent from Natal). *C. glomerata* Thunb. has a similar distribution in South Africa as the type, but is not known elsewhere.

Remarks.—No satisfactory distinction can be drawn between this species and *Carex glomerata* Thunb. (= var. β Wahlenb. in "Vet. Akad. Handl. Stockholm," XXIV, 144). In the enumeration of specimens I have tried to separate them the best way I could. I may add that I have seen specimens of both "species" which were named by Clarke and by Kükenthal. The differences in the size and colour of the inflorescence emphasized by Clarke in "Flora Capensis," VII, 299, and by Kükenthal in "Pflanzenreich," IV (20), 166, are very elusive. Kükenthal ascribes to *C. glomerata* an elongated rhizome, while in *C. vulpina* it is, according to him, short; but our specimen of Schlechter 6286, which he has seen and which he quotes, has a remnant of an elongated rhizome, and this is well shown in Hepburn 293, which undoubtedly is the same species. Galpin 5602, named by Stapf *Carex vulpina* L., has a pale inflorescence. Both authors place MacOwan's specimens from Grahamstown under *C. glomerata*, but we have some which they would have to place under *C. vulpina*.

PLATE LXXIX (Mogg 6619).

Carex zuluensis C. B. Cl., in Kew Bull., Add. Ser. VIII (1908), 74; *C. condensata* C. B. Cl. (non Nees) in "Flora Capensis," VII, 305, and "Flora of Trop. Africa," VIII, 521; *C. Huttoniana* Kük. in "Pflanzenreich," IV, 20, 271.

A.—Plant, half natural size.
B.—Pseudo-spikelet, magnified six times.
C.—Female flower, magnified six times.
D.—Female flower (surrounded by utricle), magnified six times.

Specimens Examined.—Britten 975, swampy places, Howiesons Poort, near Grahamstown; Rattray 286, Hogsback; Sim 923, top of Pirie; Schlechter 6341, Umtata (utricle glabrous); Schönland 4114, 4123*a*, grassy slopes on mountain between Qumbu and Shawbury, *c.* 3600 ft.; Tyson 1295, 1846, Griqualand East; Mogg 6619, Allerton, Natal, 2500 ft.; Mogg 6737, Lidgetton, Natal (stream banks in forest. 4150 ft.); Hutton 147, 344, Shafton, Howick; Mogg 6219, Zululand, 2900 ft.

Distribution.—South-eastern South Africa, extending to the Orange Free State and the Transvaal, also on Mt. Milangi, Nyassaland, in West Usambara, and on the Kilimandjaro.

Remarks.—This species has a great resemblance to *Schoenoxiphium rufum*, β *Dregeanum*.

PLATE LXXX (Mogg 6308 and Hutton 144).

Carex cernua Boott., γ *austro-africana* Kük. in "Pflanzenreich," IV, 20, 354; *C. phacota* C. B. Cl. (non Spreng.) in "Flora Cap.," VII, 302.

A.—Basal portion of plant, natural size.
B.—Upper portion of flowering stem bearing one male spikelet at the top and four female pseudo-spikelets, natural size.
C.—Bract of partial female spikelet, magnified six times.
D.—Female flower, magnified six times.
E.—Female flower, enclosed in utricle, magnified six times.

Specimens Examined.—Hutton 144, 351, Shafton, Howick; Wood 4038, Mooi River; Mogg 6427, St. Ives, Natal; Mogg 6508, Glen Arum, Balgowan; Moss 201, near Pretoria; Pott 5227, Spitzkop.

Distribution.—Natal, Transvaal, and Orange Free State.

Remarks.—The variety here figured is only known from eastern South Africa. Another variety occurs in New South Wales and New Caledonia. The type of the species is found in south and east Asia.

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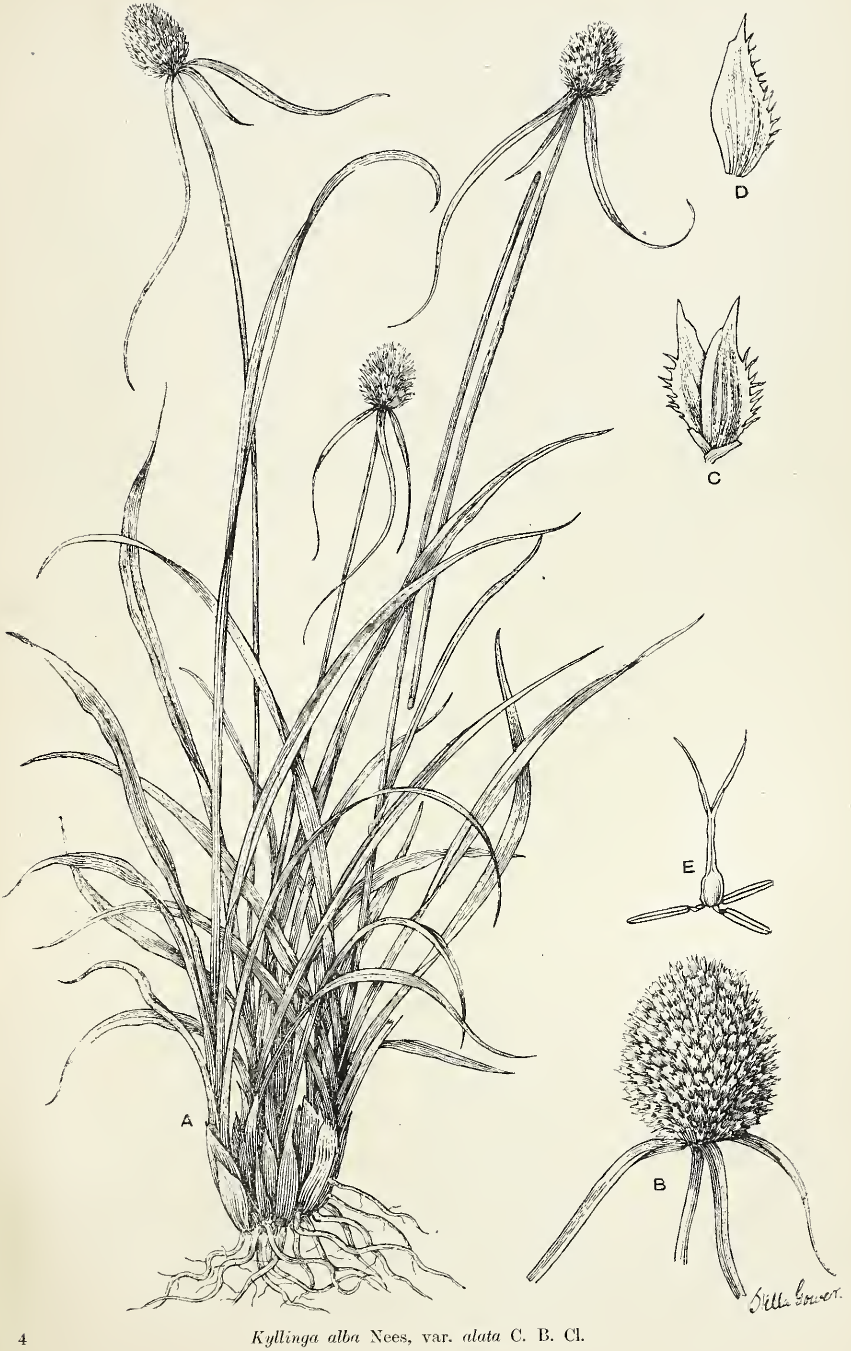
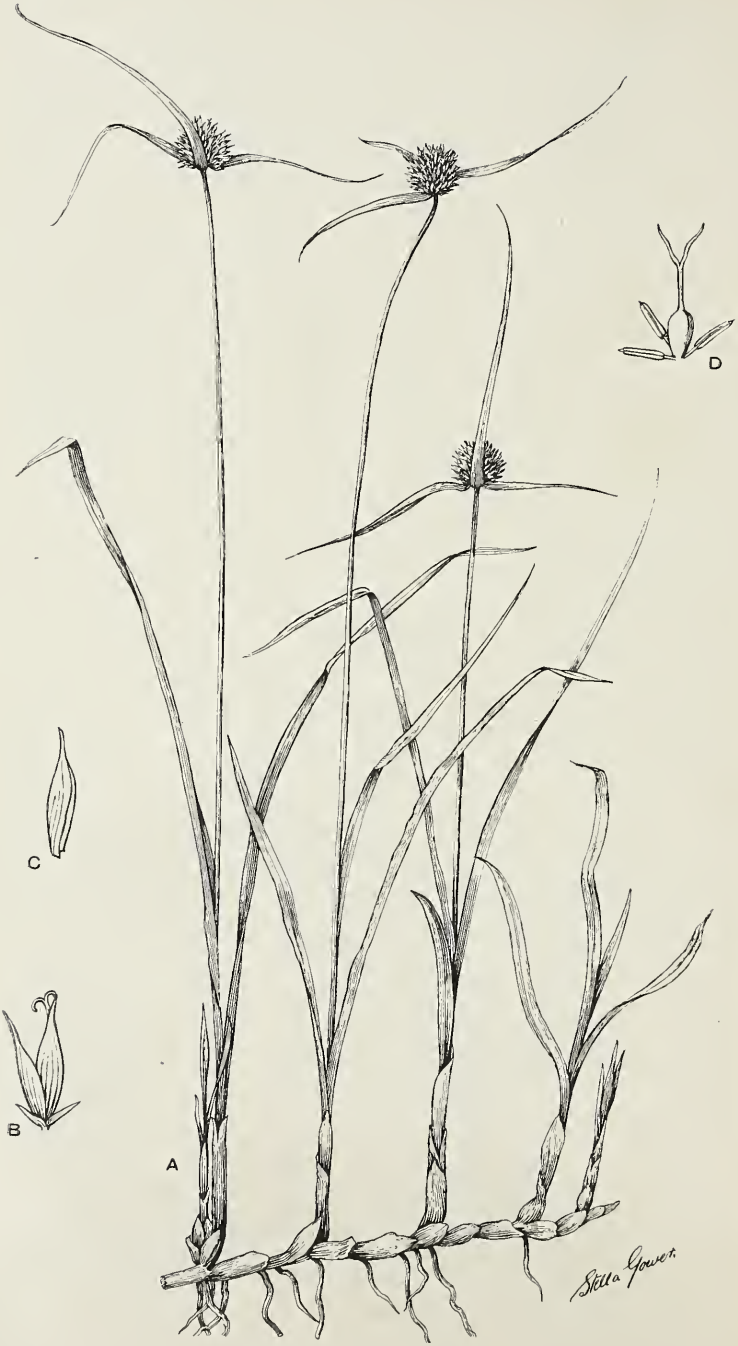
Plate I.



Stella Gower.

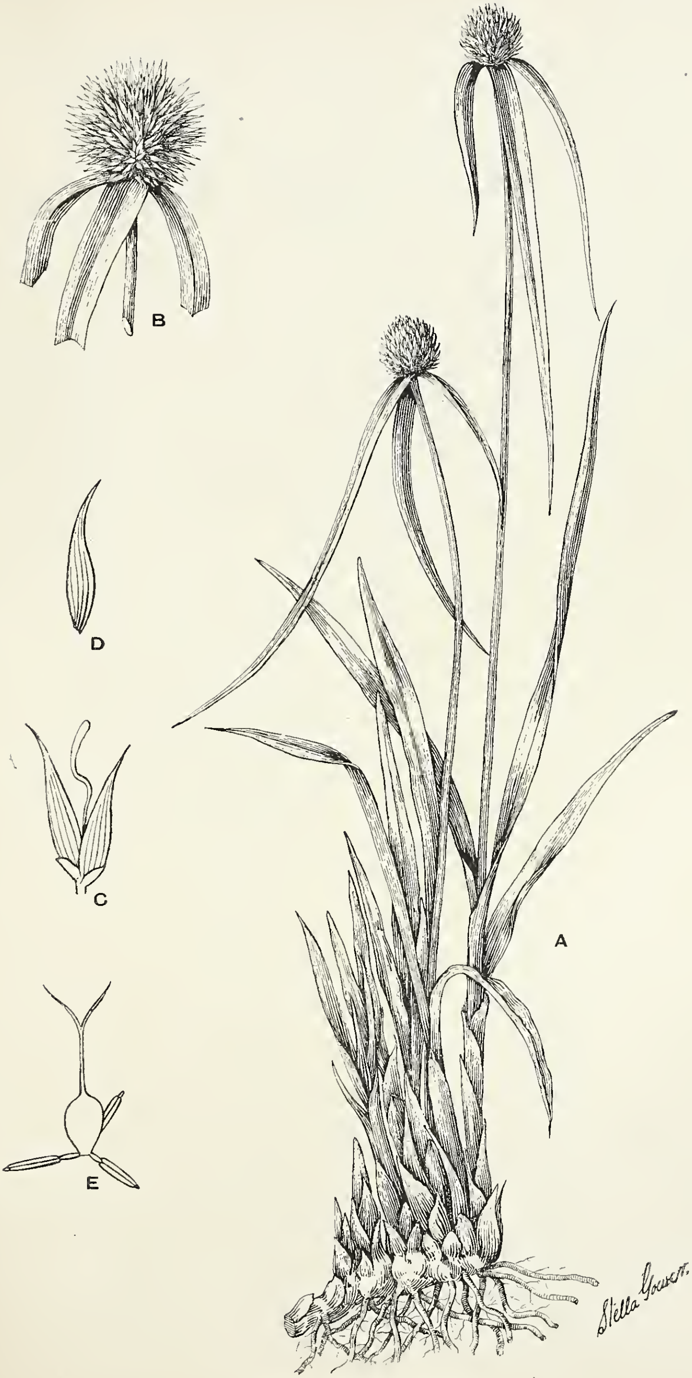
Kyllinga alba Nees, var. *alata* C. B. Cl.

Plate II



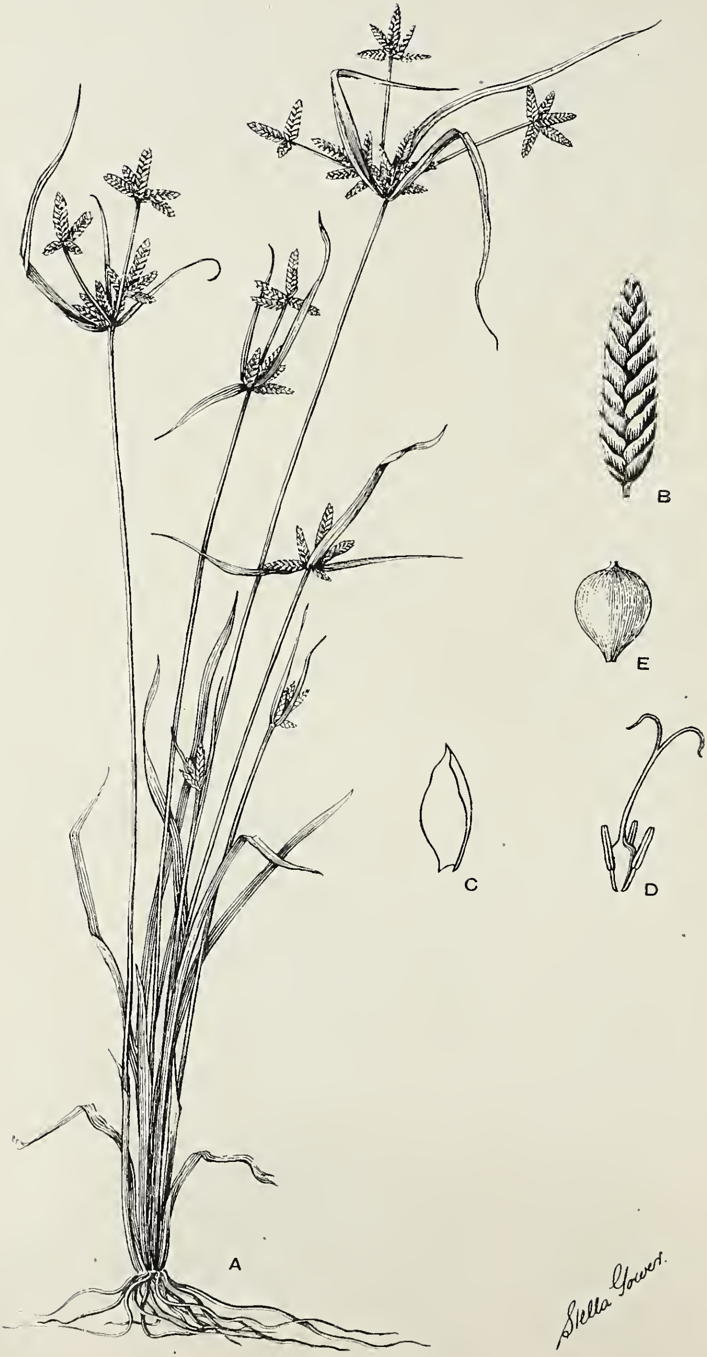
Kyllinga erecta Schum.

Plate III.



Kyllinga melanosperma Nees.

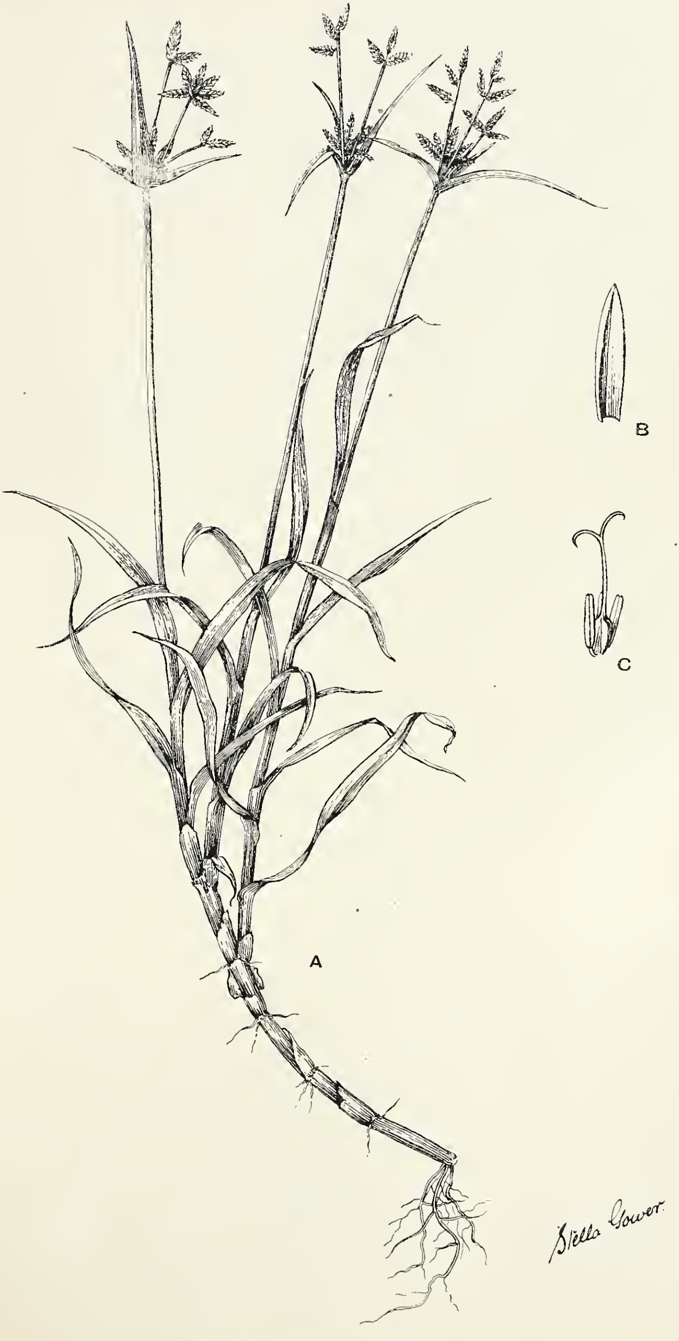
Plate IV.



Stella Gower.

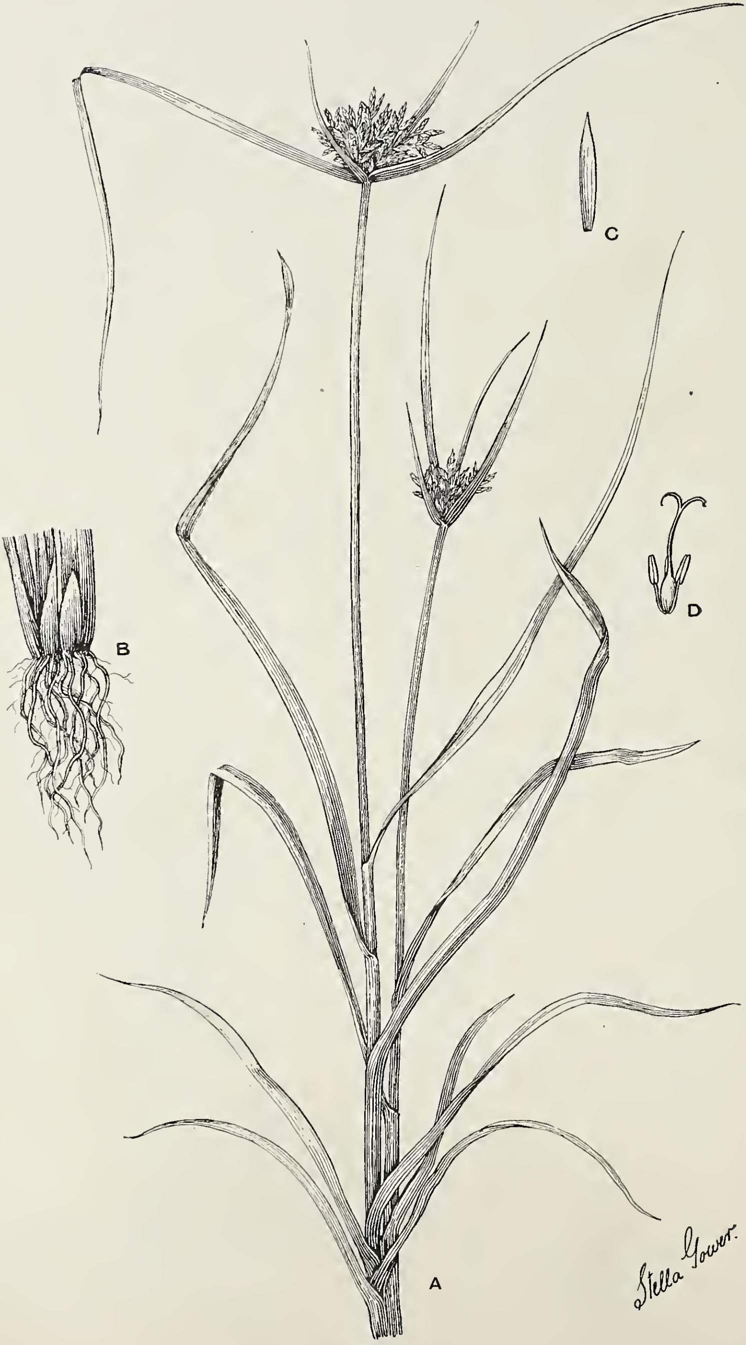
Pycreus flavescens Reichb.

Plate V.

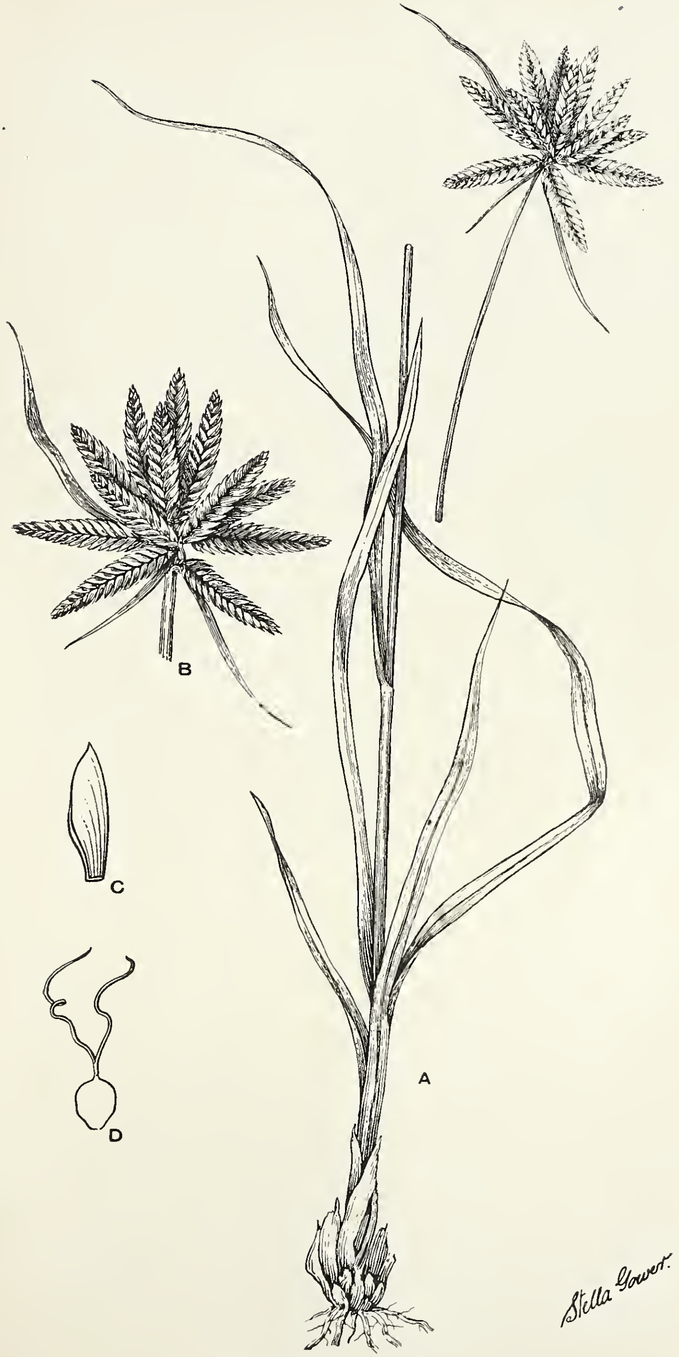


Pycreus Mundtii Nees.

Plate VI.

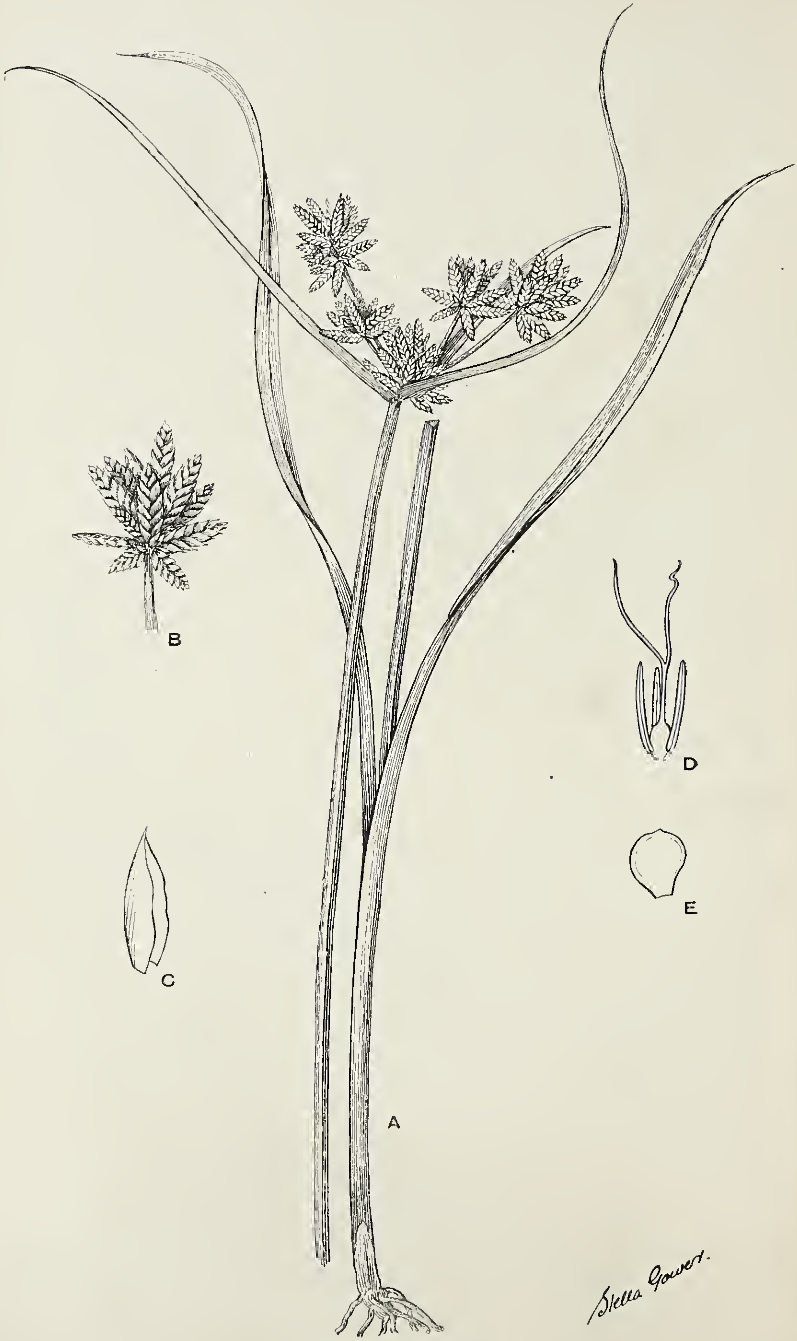


Pycreus polystachyus Beauv.



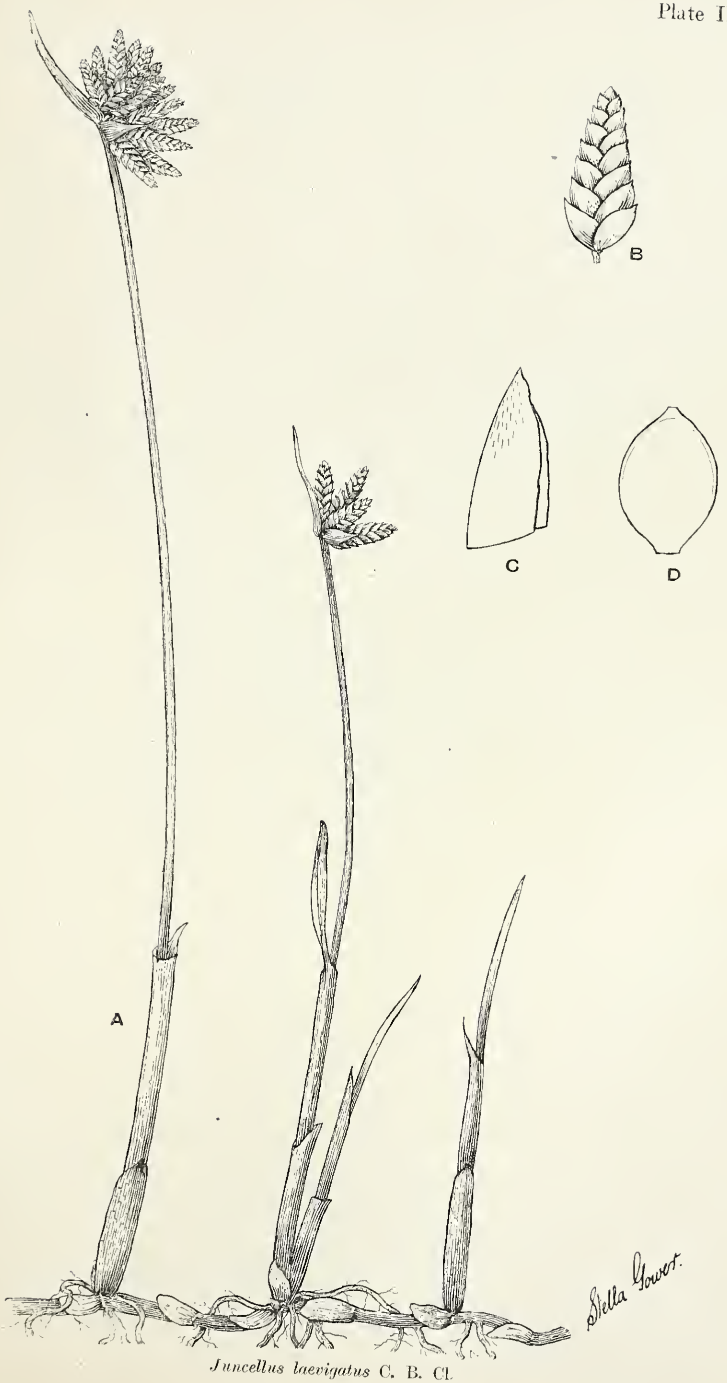
Pycreus umbrosus Nees.

Plate VIII.



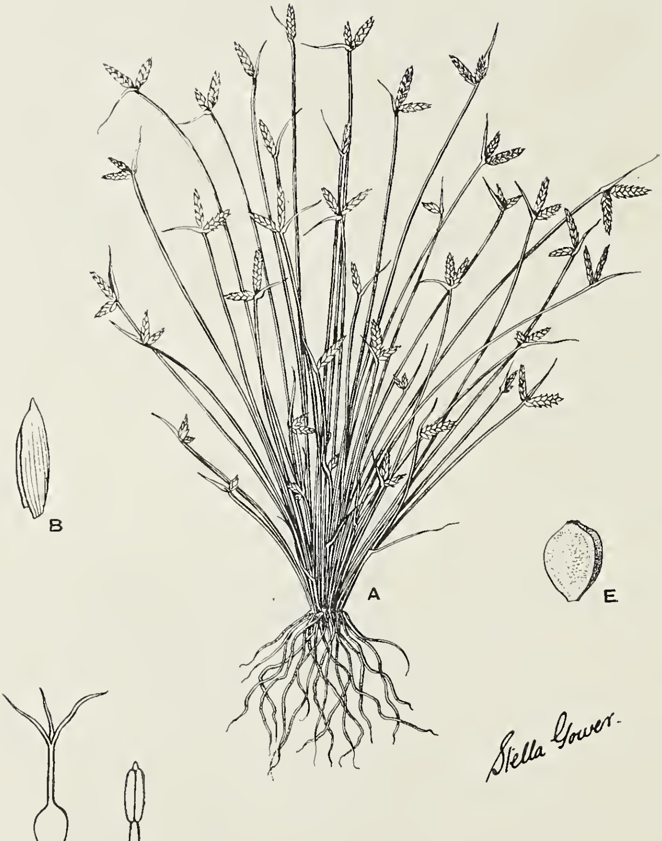
Pycreus angulatus Nees.

Plate IX.



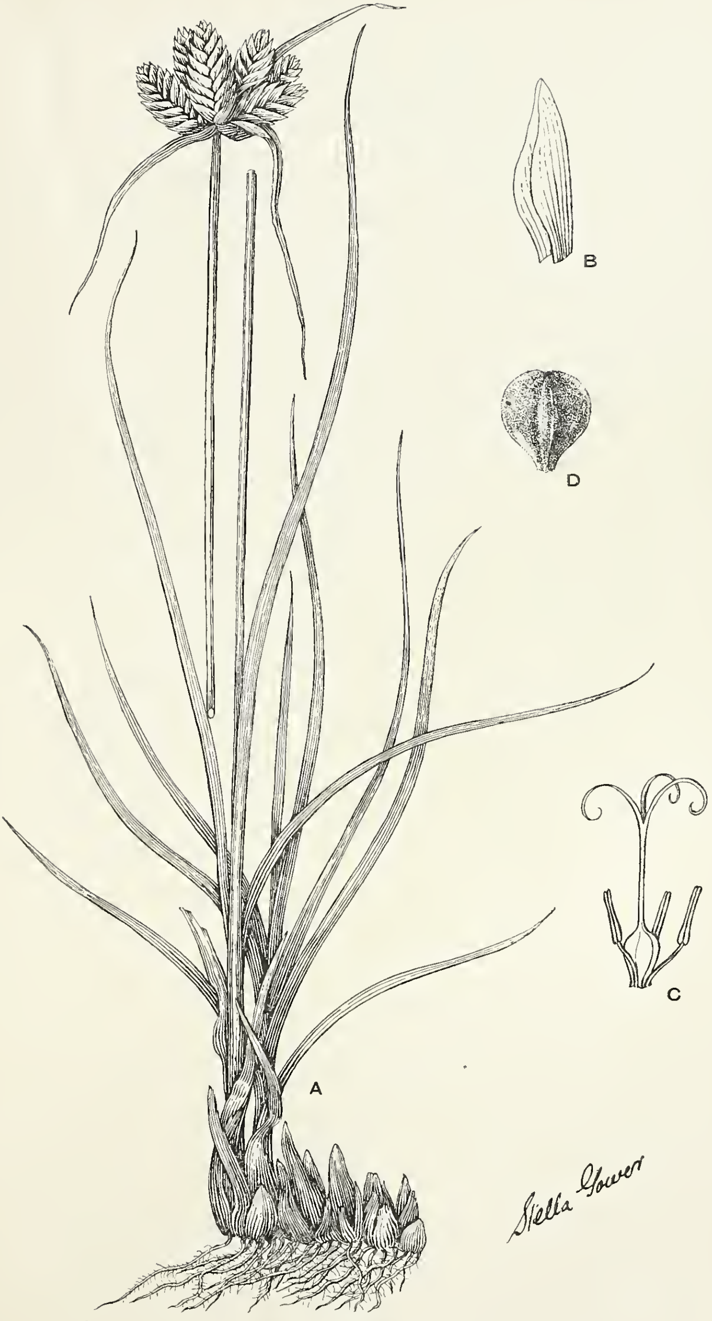
Juncellus laevigatus C. B. Cl.

Plate X.



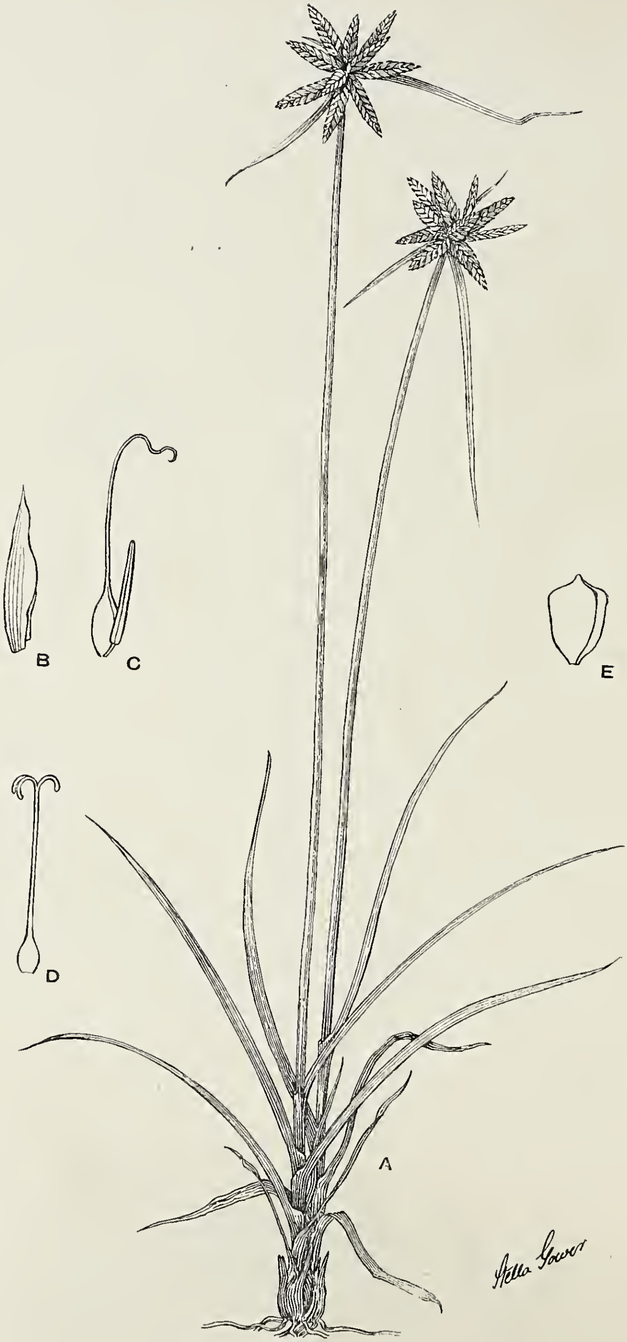
Cyperus tenellus L.f.

Plate XI.



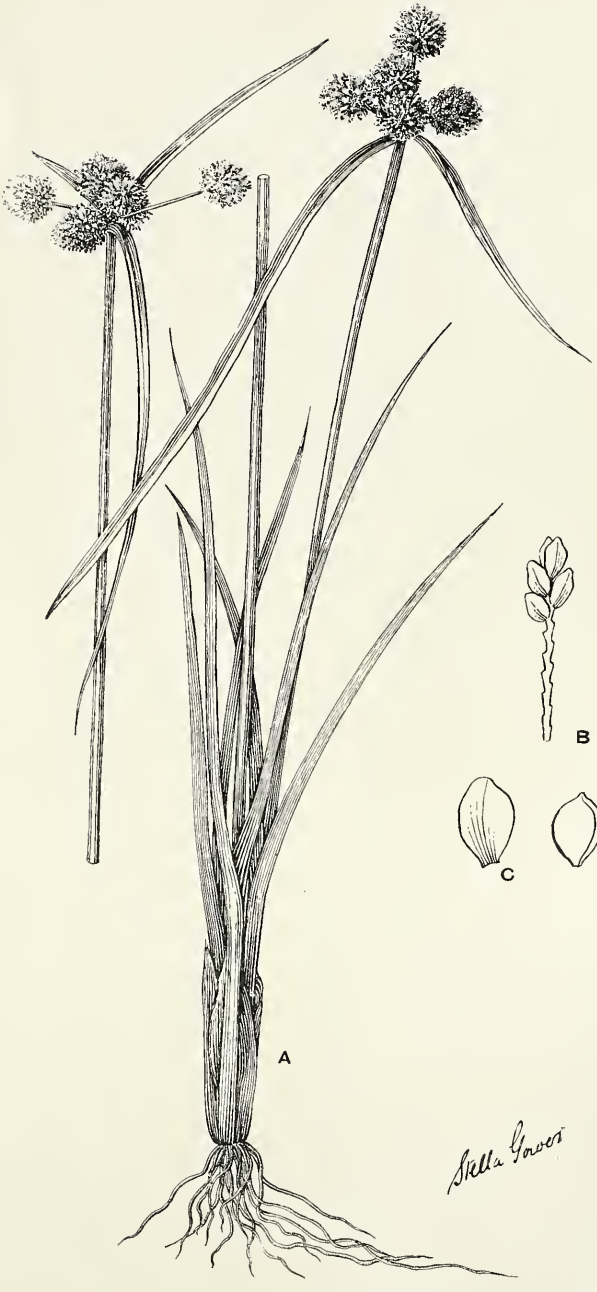
Cyperus compactus Lam., var. *flavissimus* (Schrad.) C. B. Cl.

Plate XII.



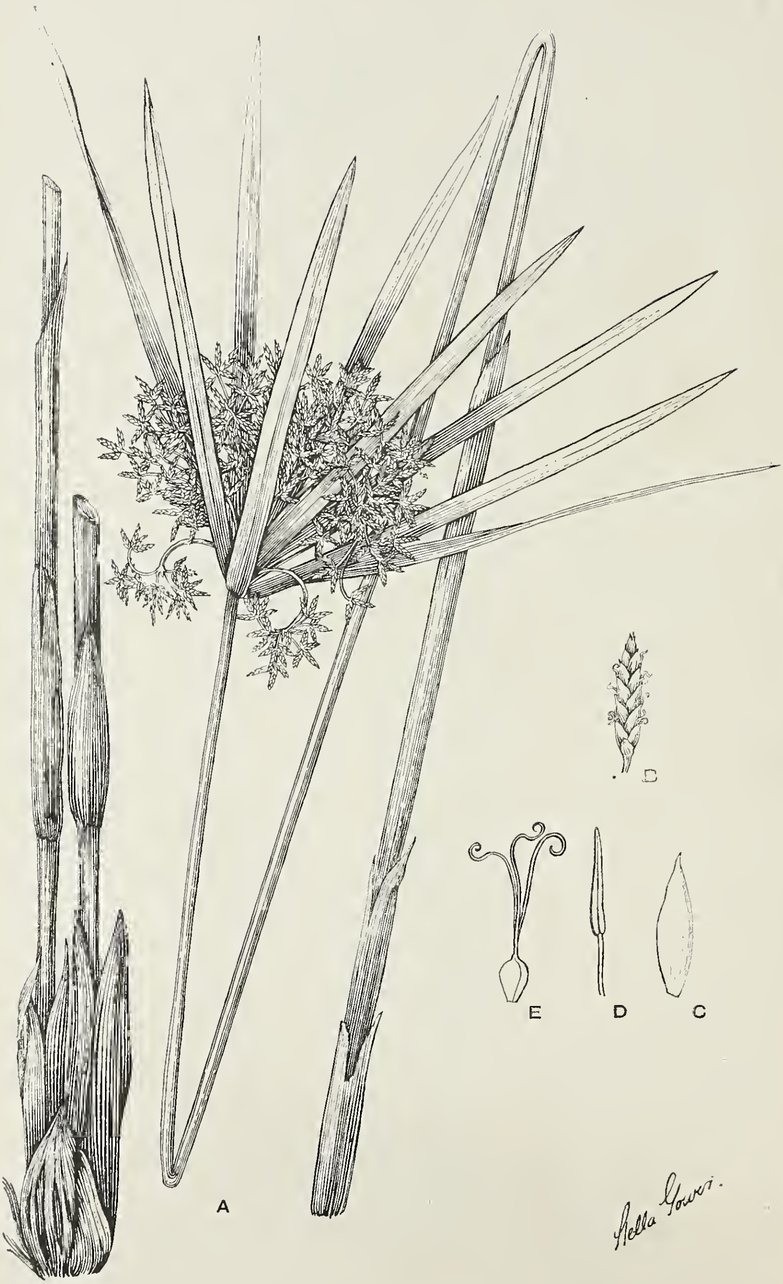
Cyperus semitrifidus Schrad.

Plate XIII.



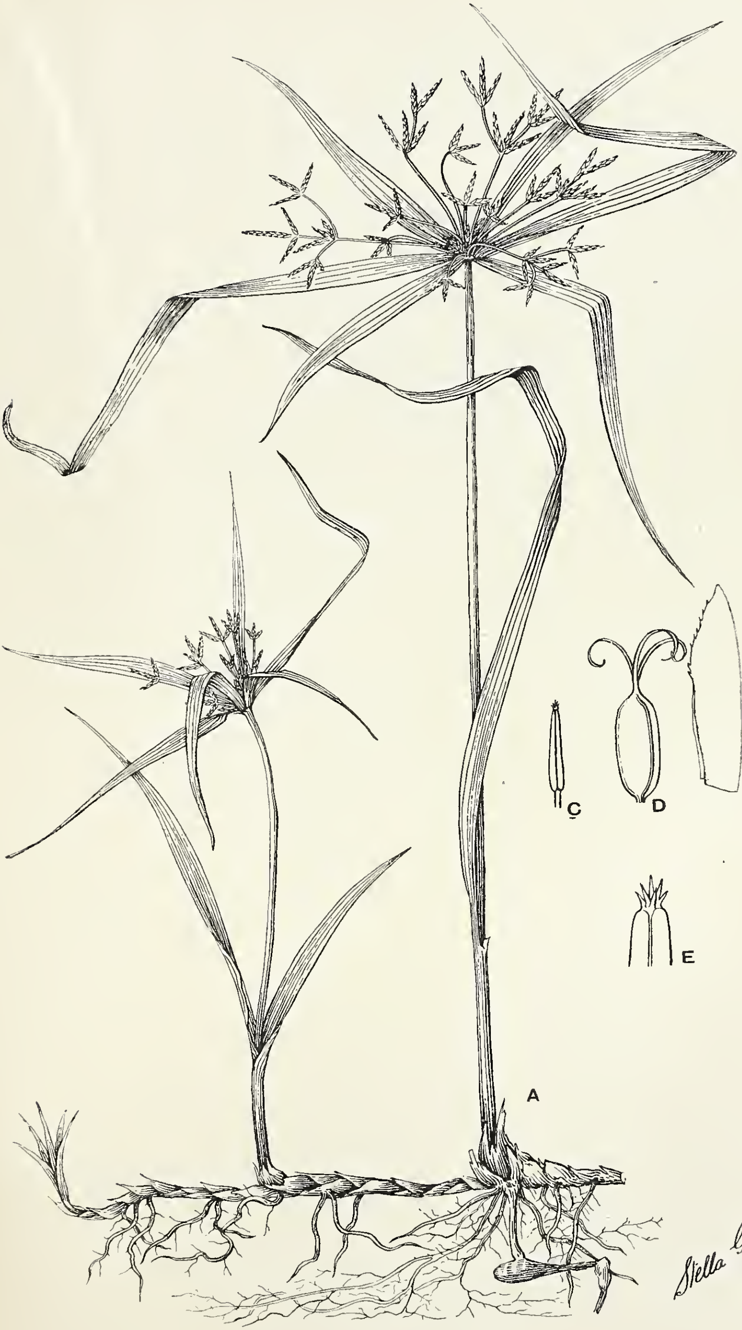
Cyperus difformis L.

Plate XIV.



Cyperus textilis Thunb.

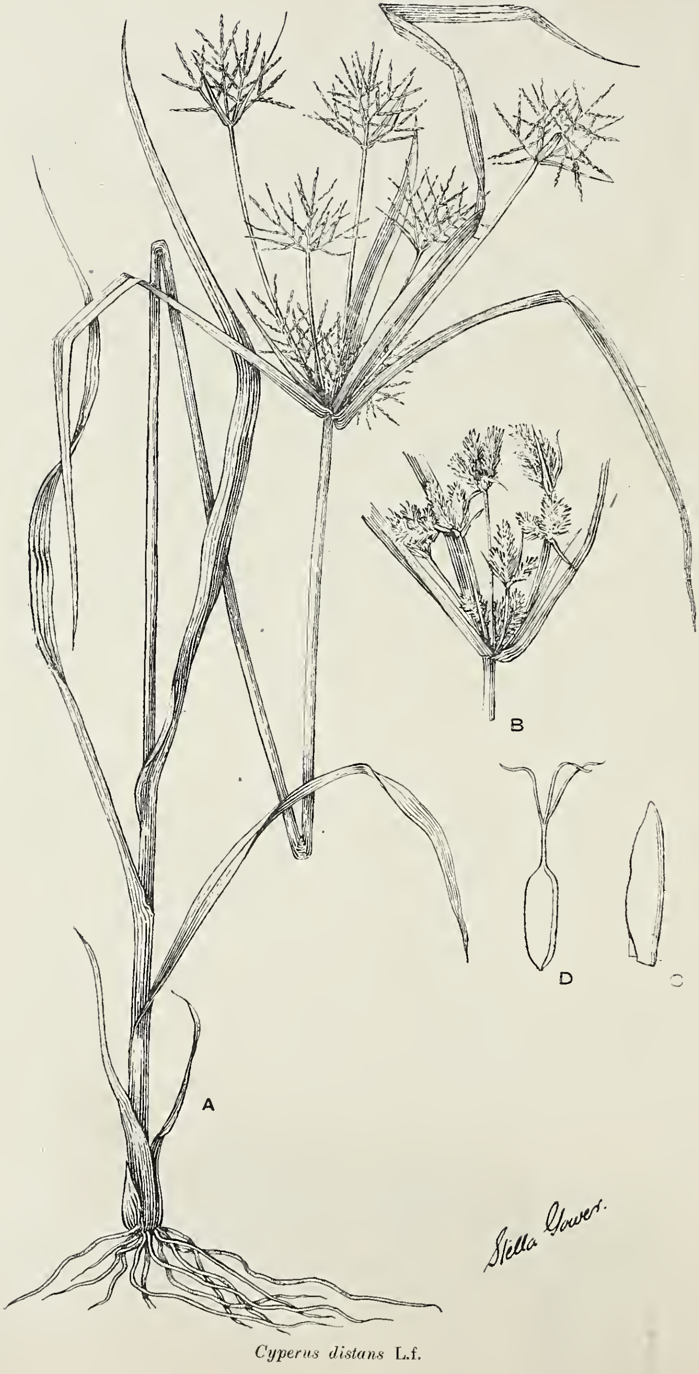
Plate XV.



Stella Gower.

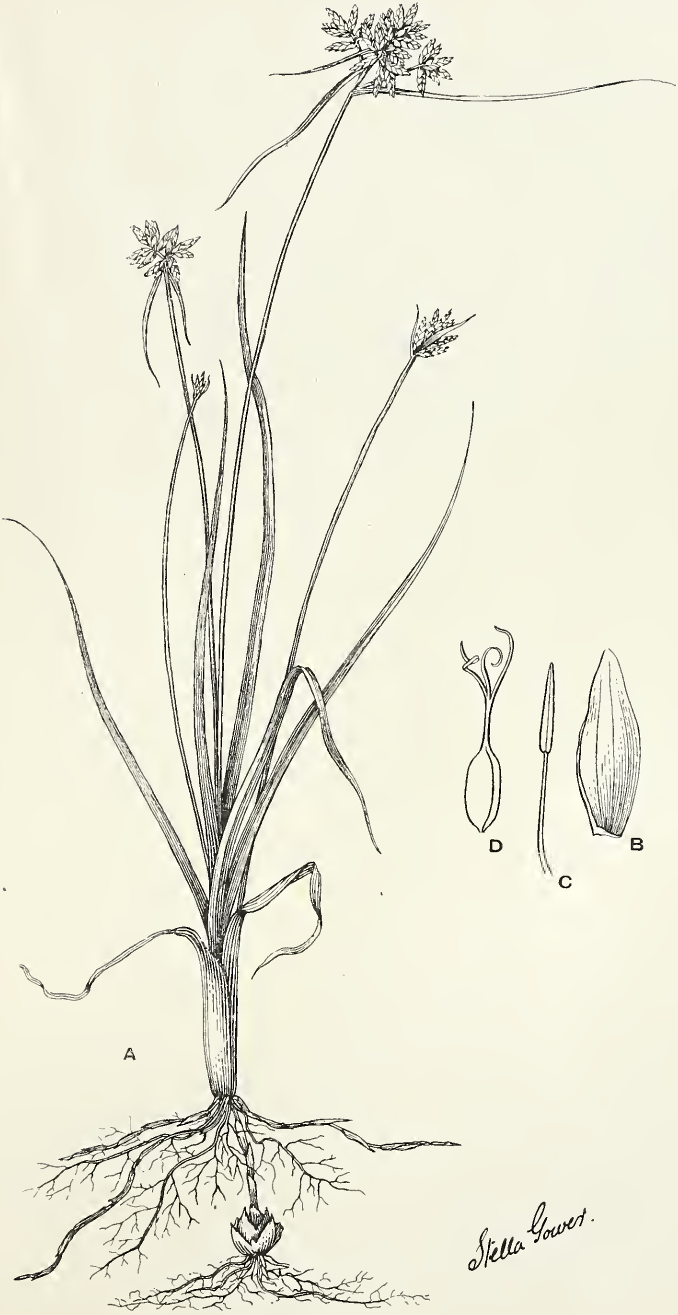
Cyperus albostriatus Schrad.

Plate XVI.



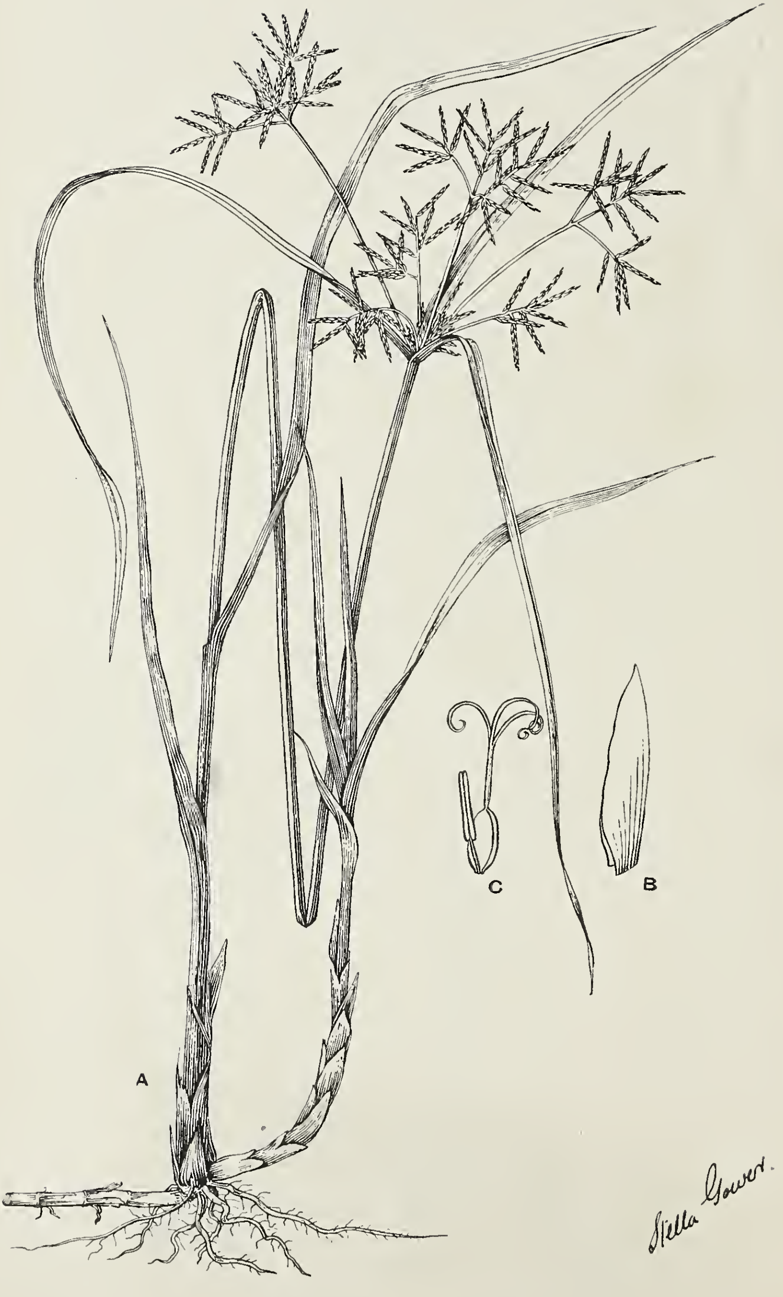
Cyperus distans L.f.

Plate XVII.



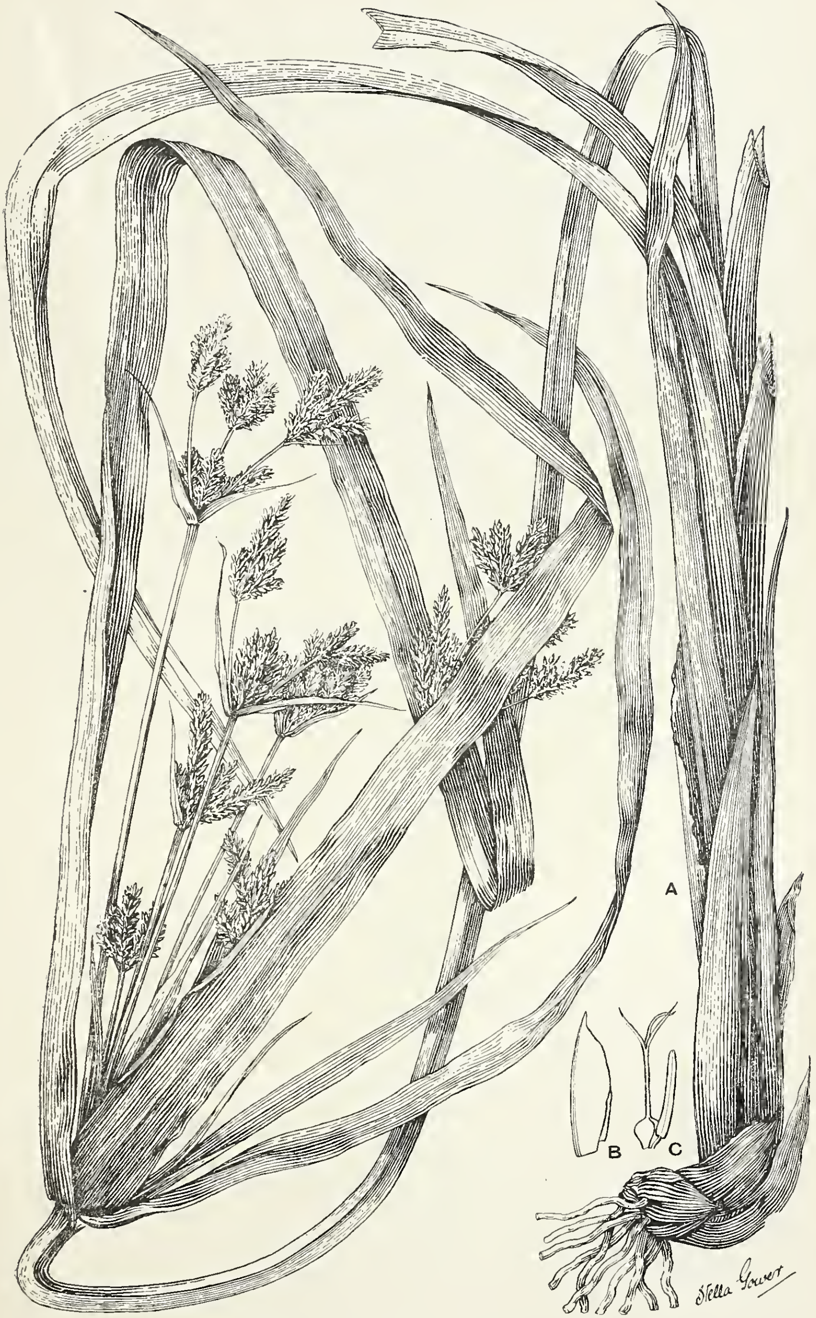
Stella Gower.

Cyperus usitatus Rottb.



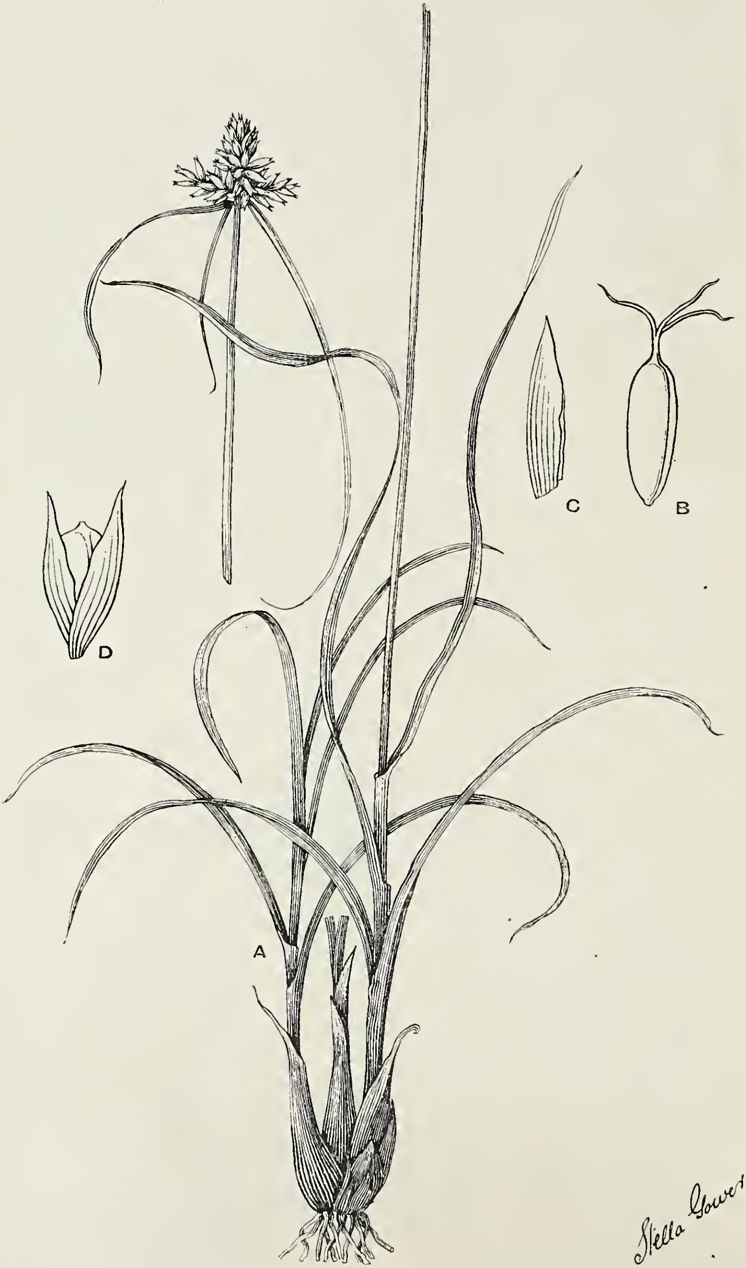
Cyperus longus L., var. *tenuiflorus* Boeck.

Plate XIX.



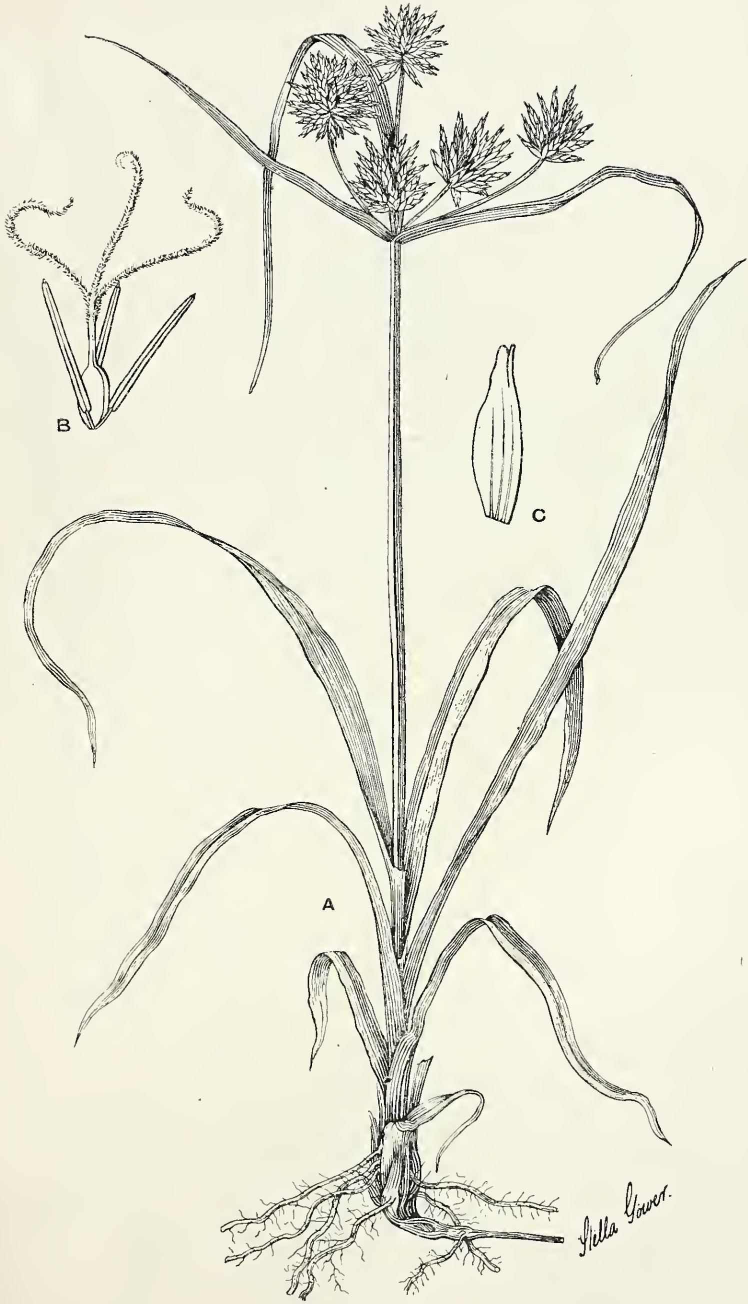
Cyperus immensus C. B. Cl.

Plate XX



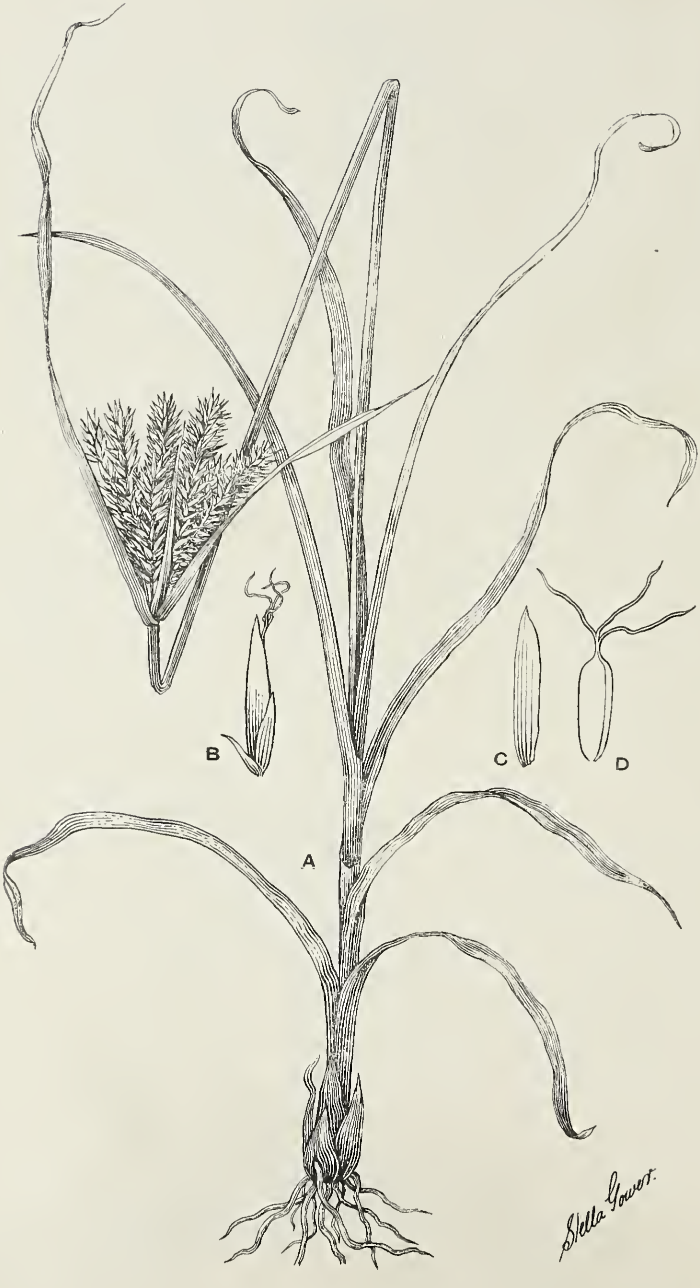
Stella Gower.

Mariscus capensis Schrad.

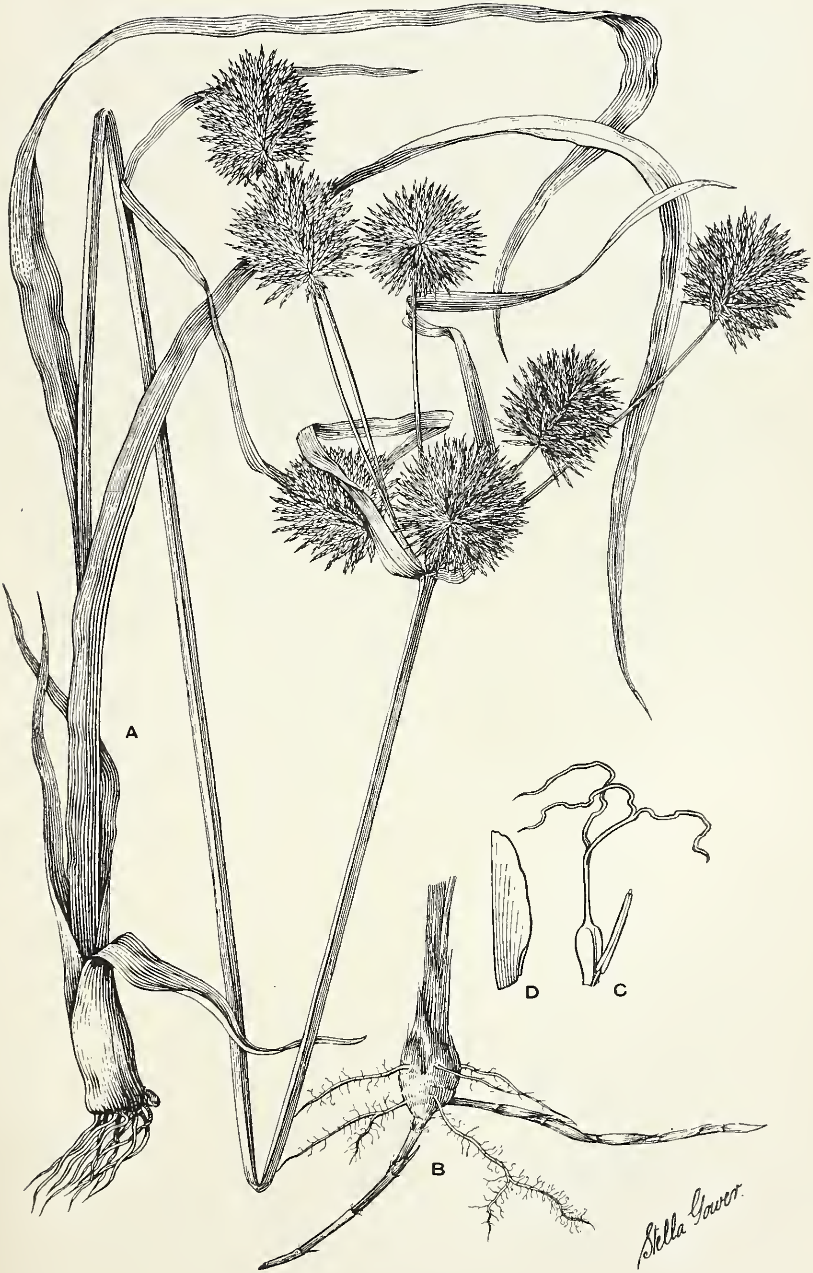


Mariscus vestitus C. B. Cl.

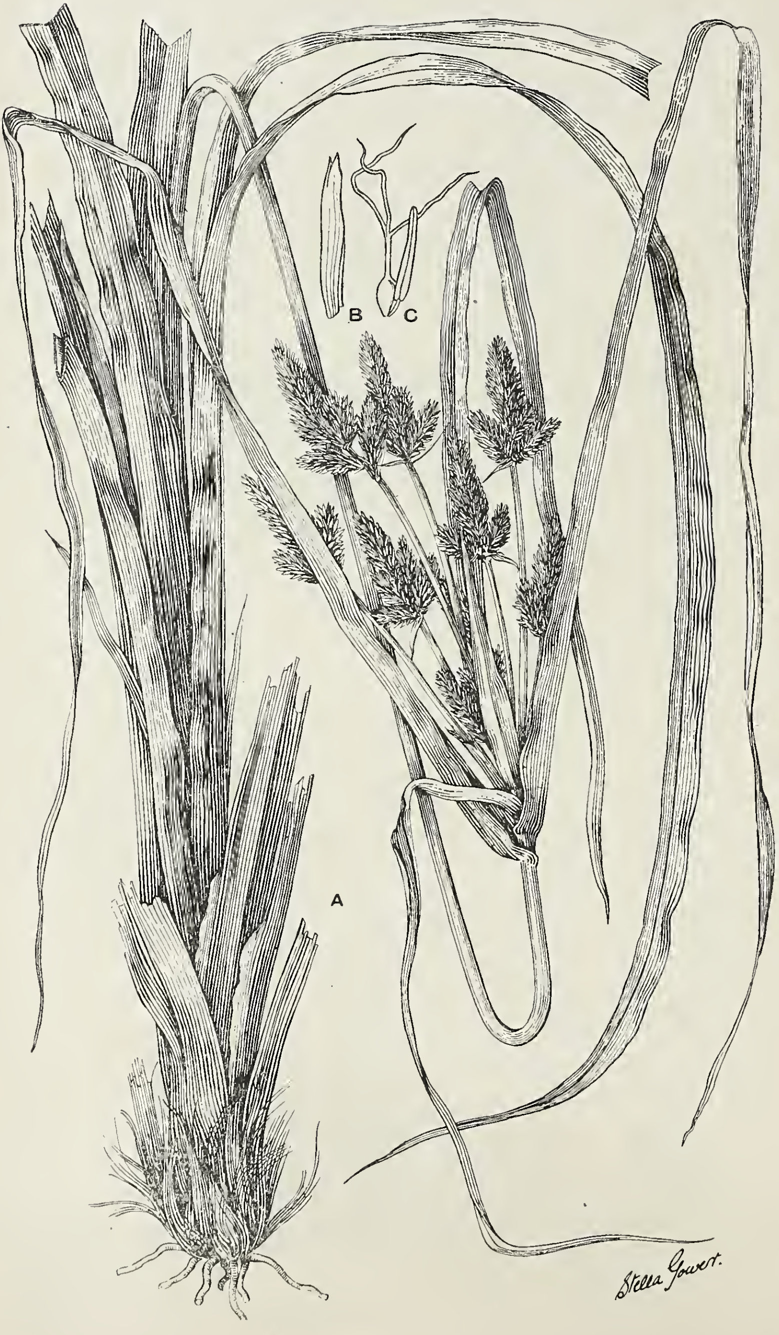
Plate XXII.



Mariscus sieberianus Nees.

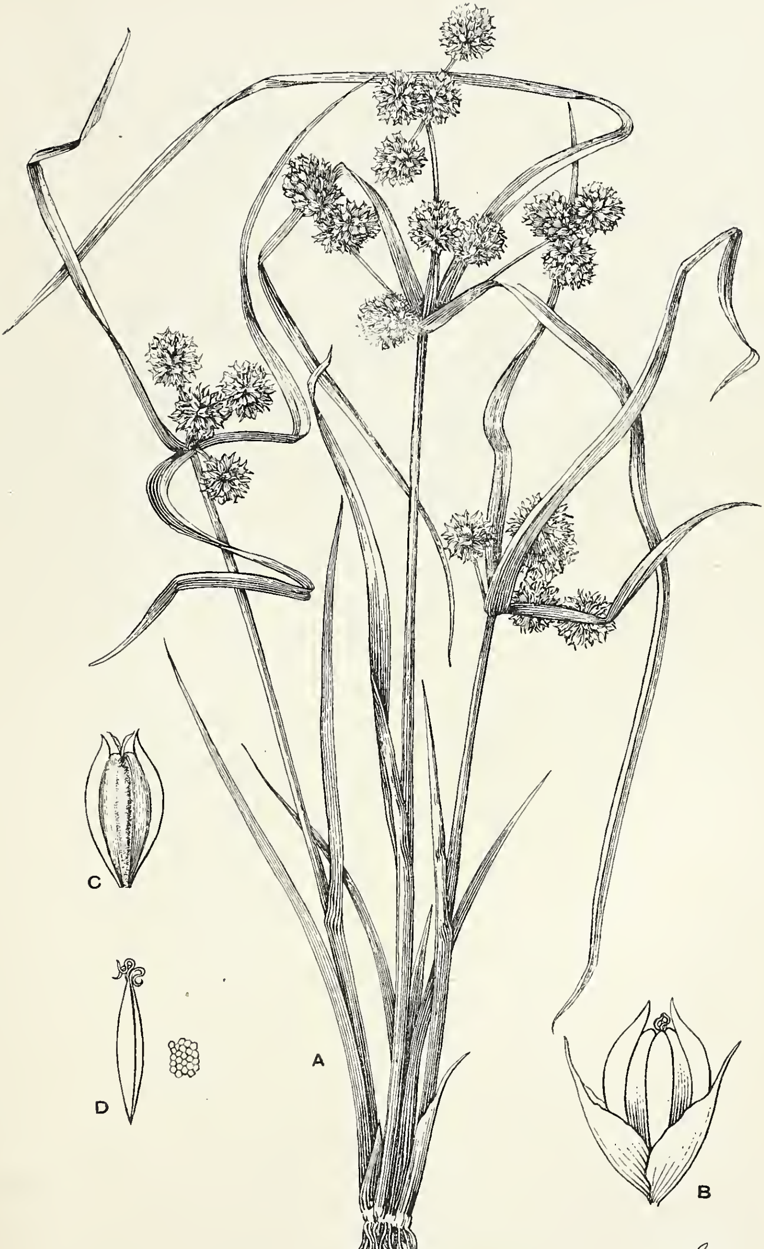


Mariscus congestus Vahl.

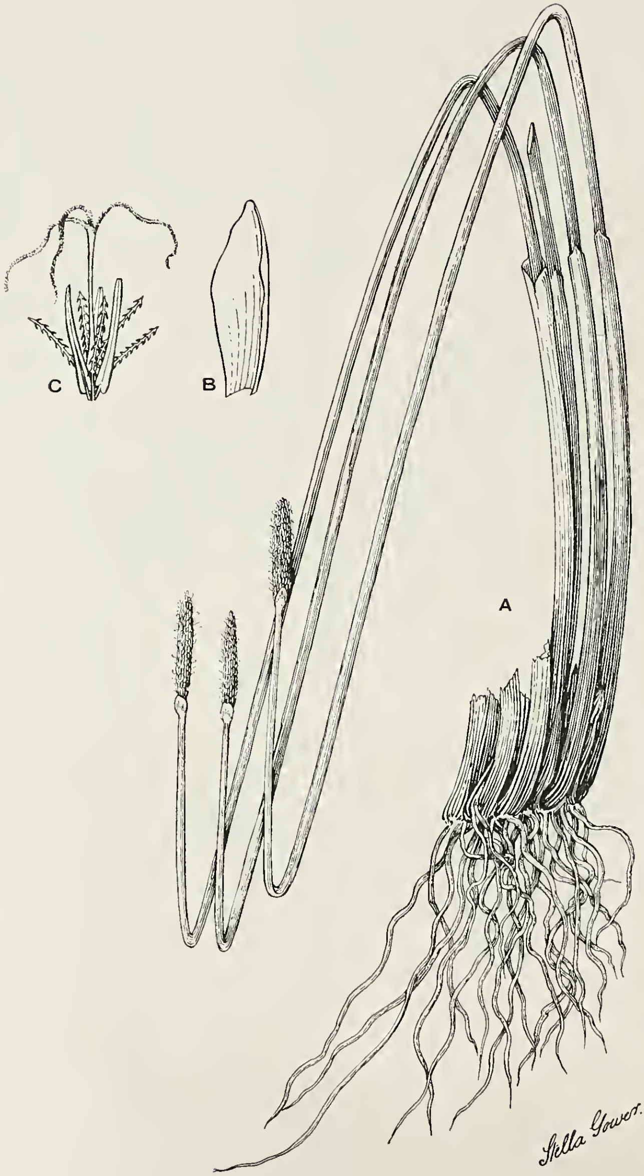


Mariscus riparius Schrad. var. *robustior* C. B. Cl.

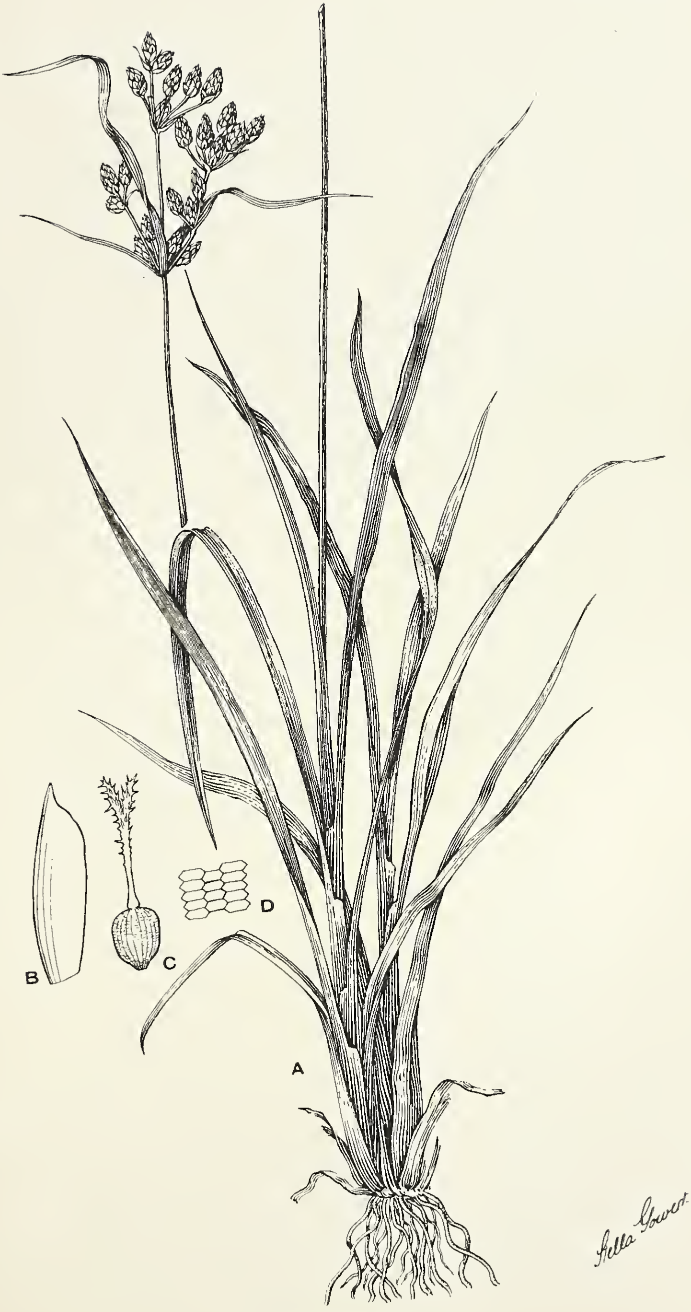
Plate XXV.



Courtoisia cyperoides Nees, var. *spicata* C. B. Cl.

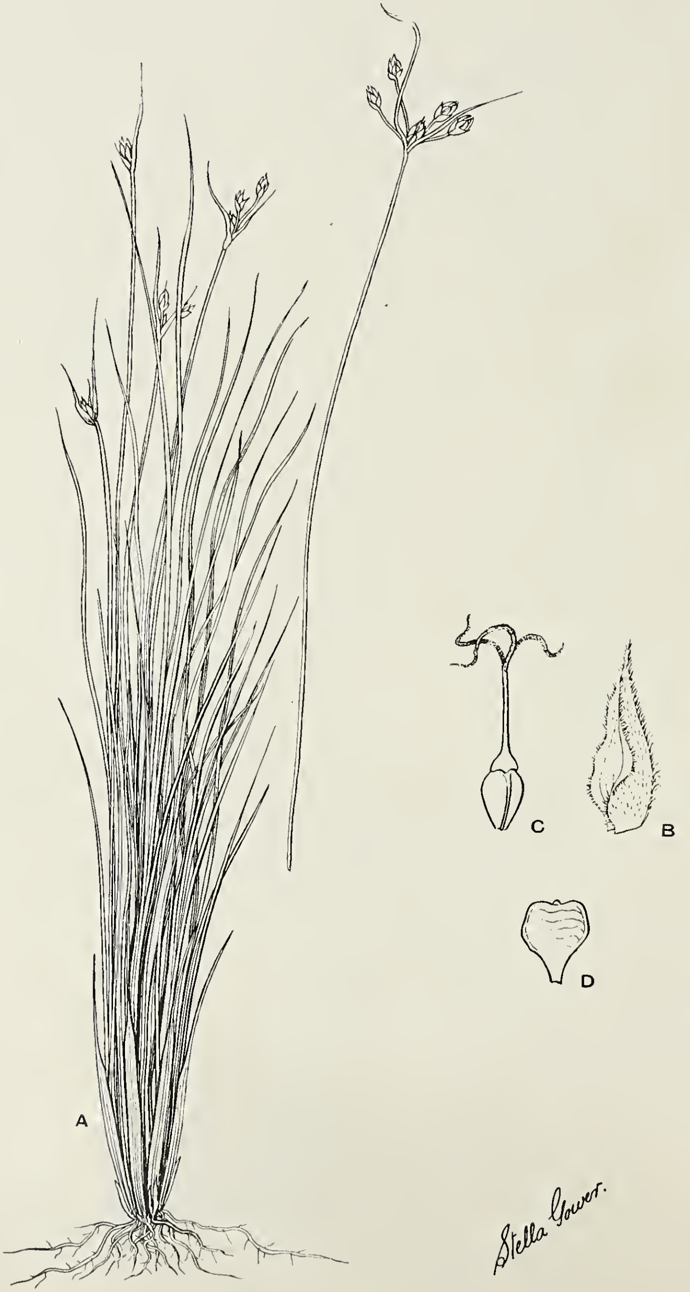


Eleocharis limosa Schult.



Fimbristylis diphylla Vahl.

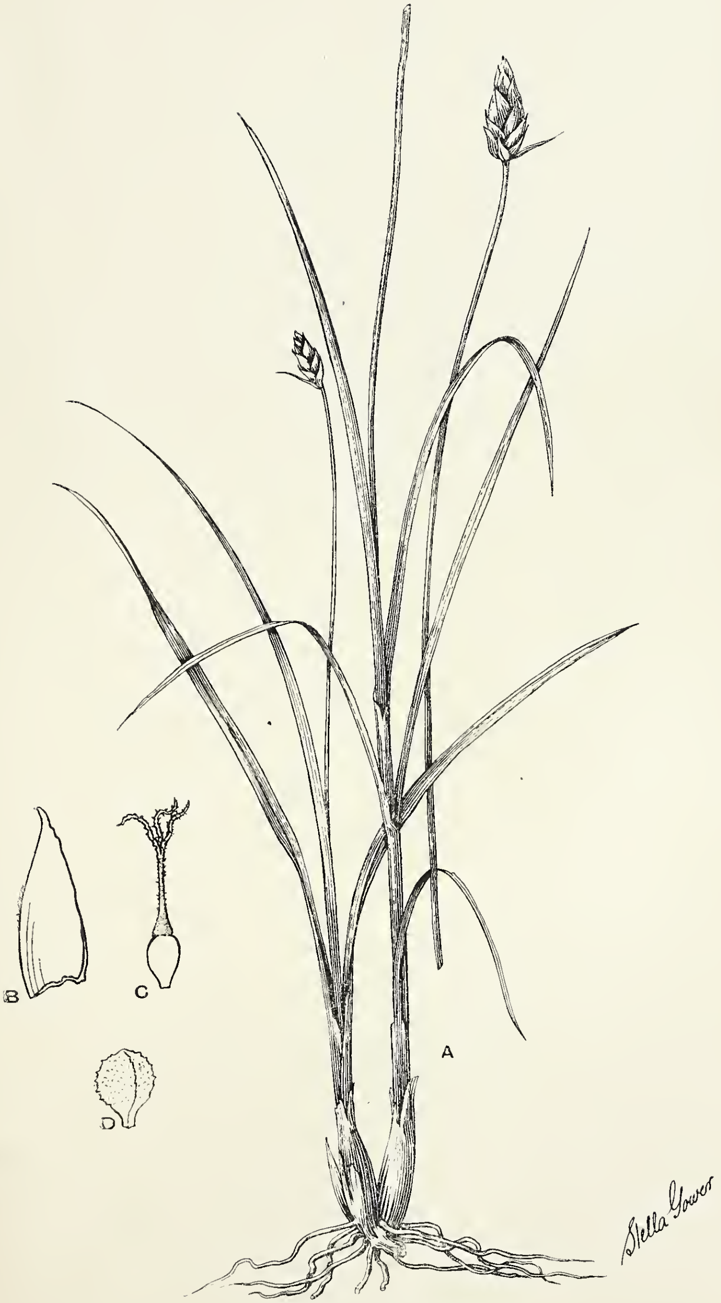
Plate XXVIII.



Stella Gower.

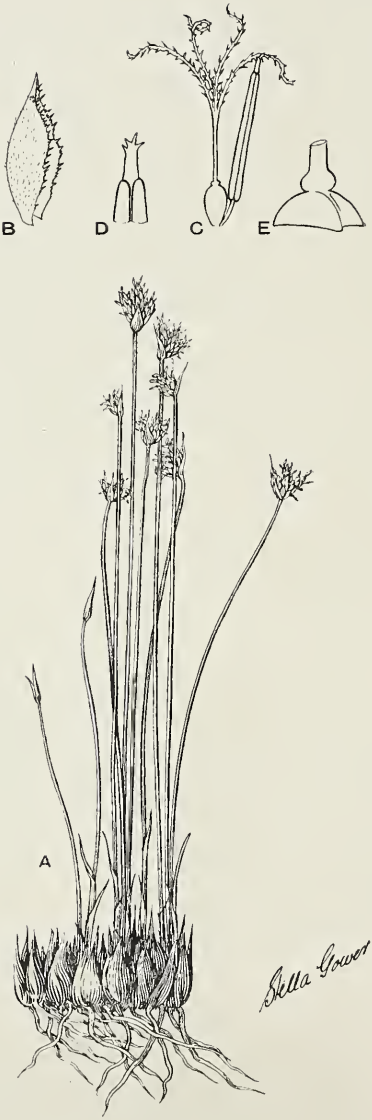
Fimbristylis exilis Roem et Schult.

Plate XXIX.



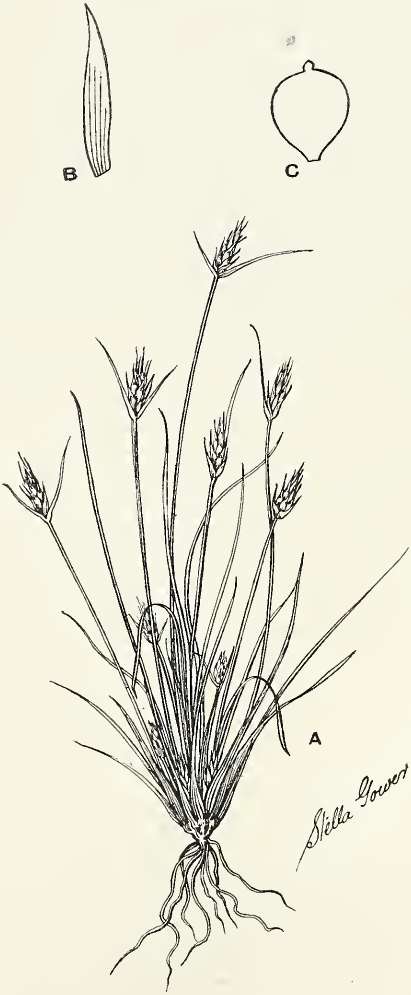
Fimbristylis monostachya Hassk.

Plate XXX.



Bulbostylis trichobasis C. B. Cl.

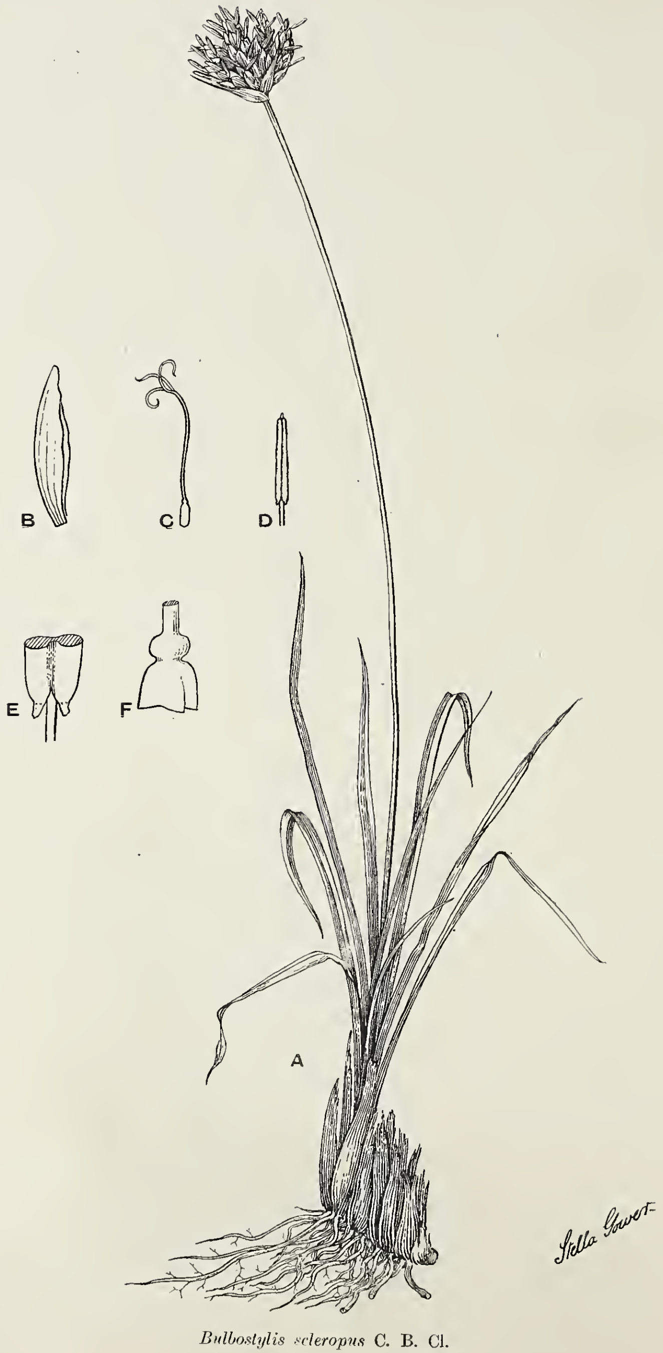
Plate XXXI.



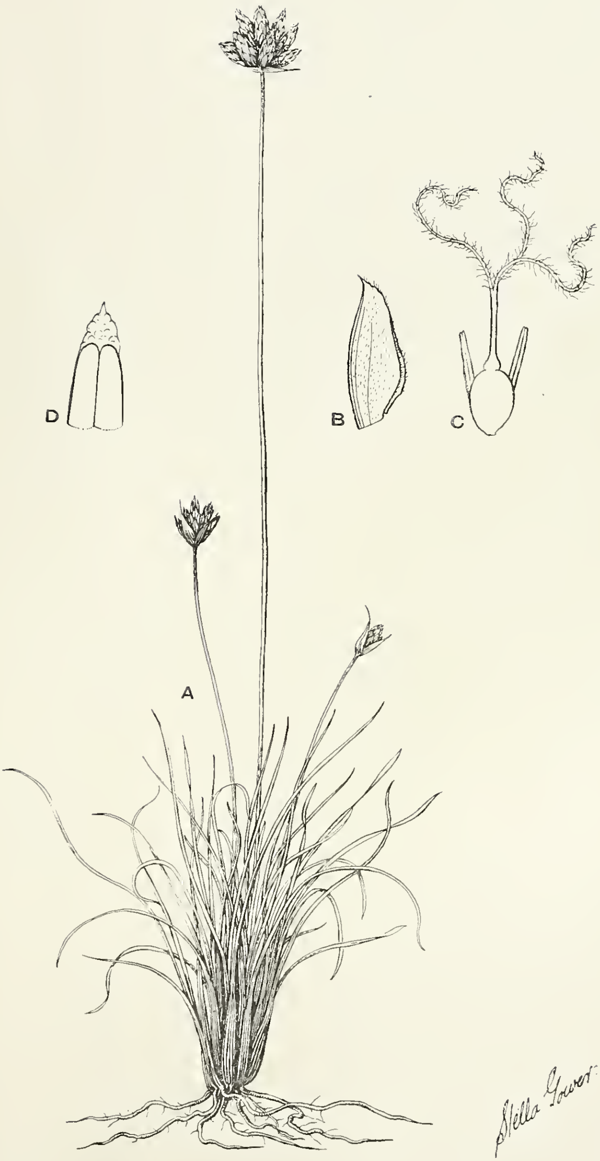
Stella Gower.

Bulbostylis humilis Kth.

Plate XXXII.



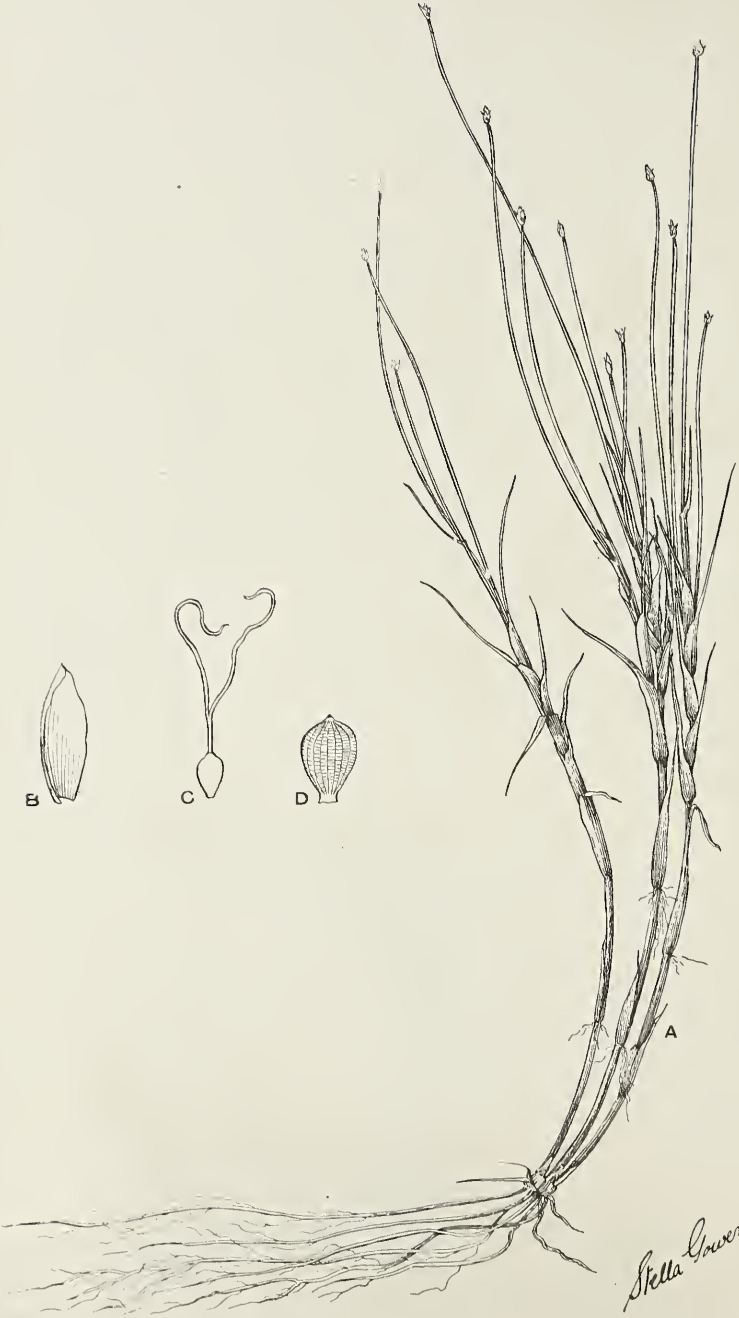
Bulbostylis scleropus C. B. Cl.



Stella Gower

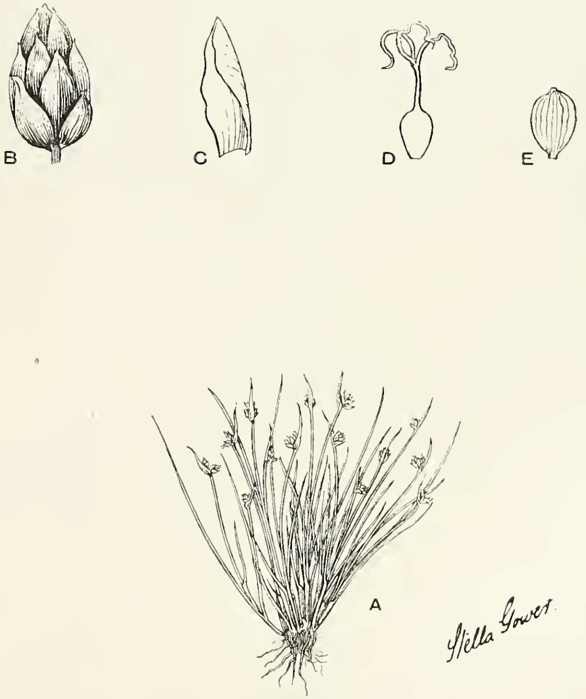
Bulbostylis collina Kth.

Plate XXXIV.



Scirpus globiceps C. B. Cl.

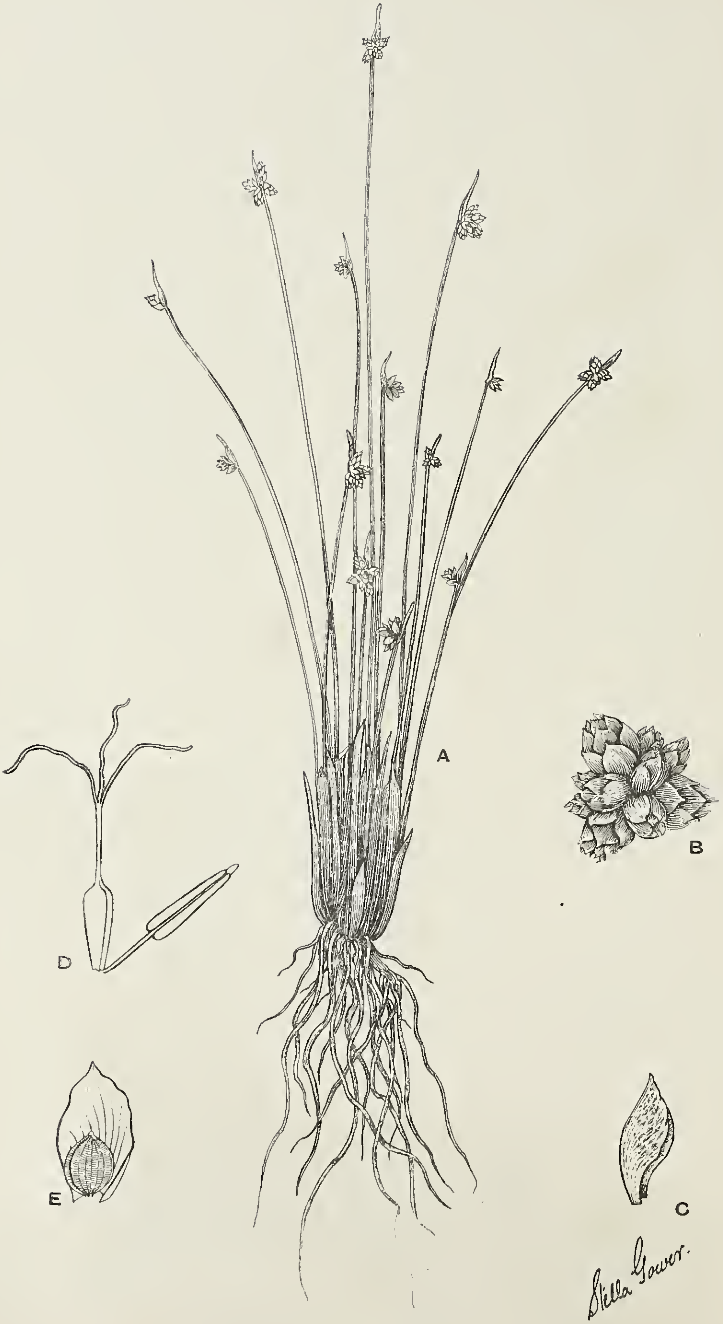
Plate XXXV.



Stella Gower.

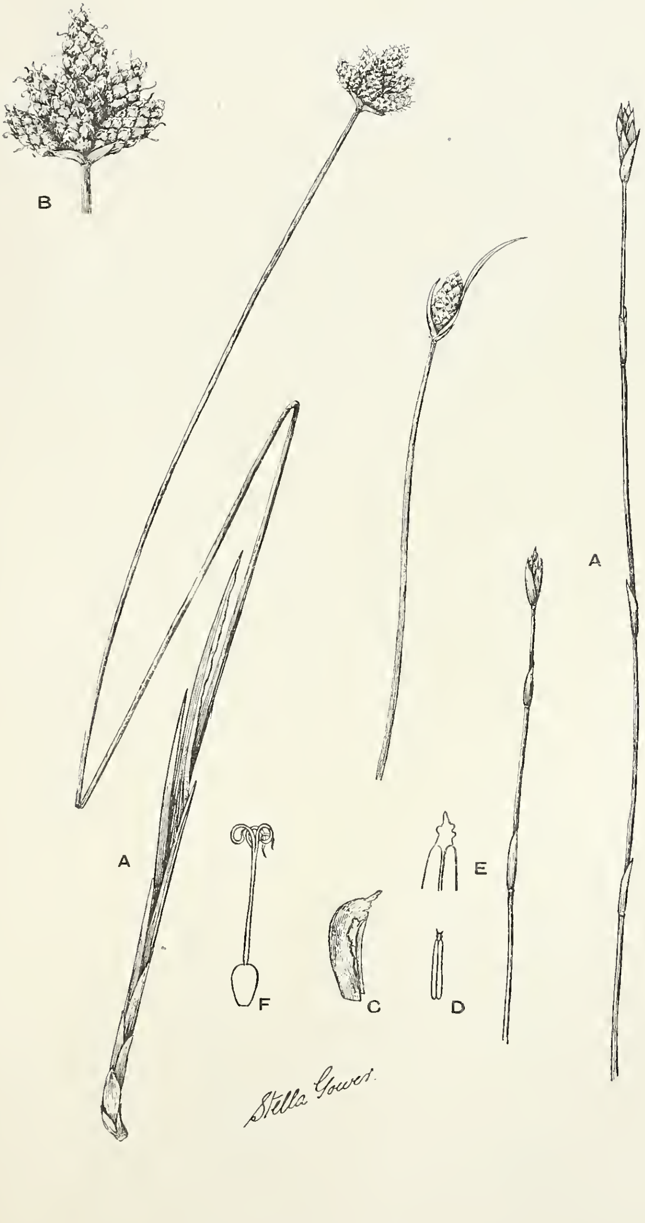
Scirpus setaceus L.

Plate XXXVI.



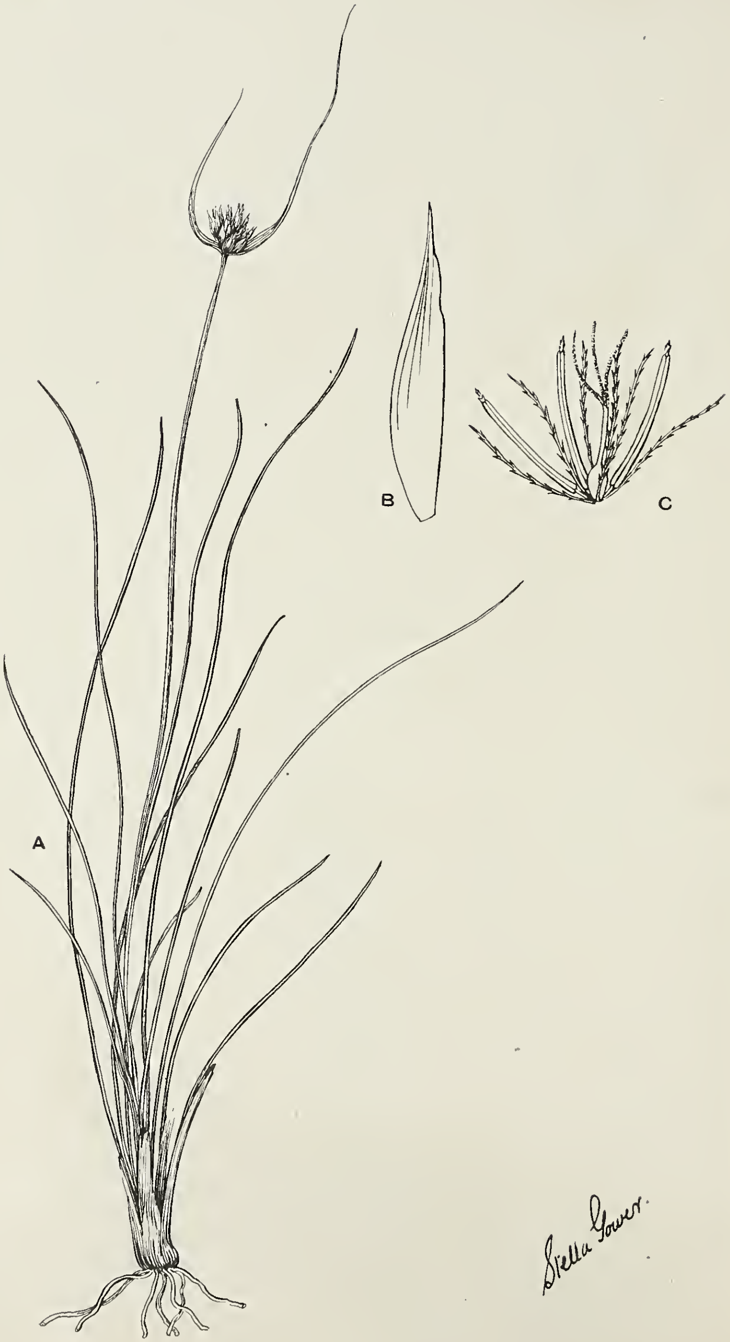
Scirpus macer Boeck.

Plate XXXVII.

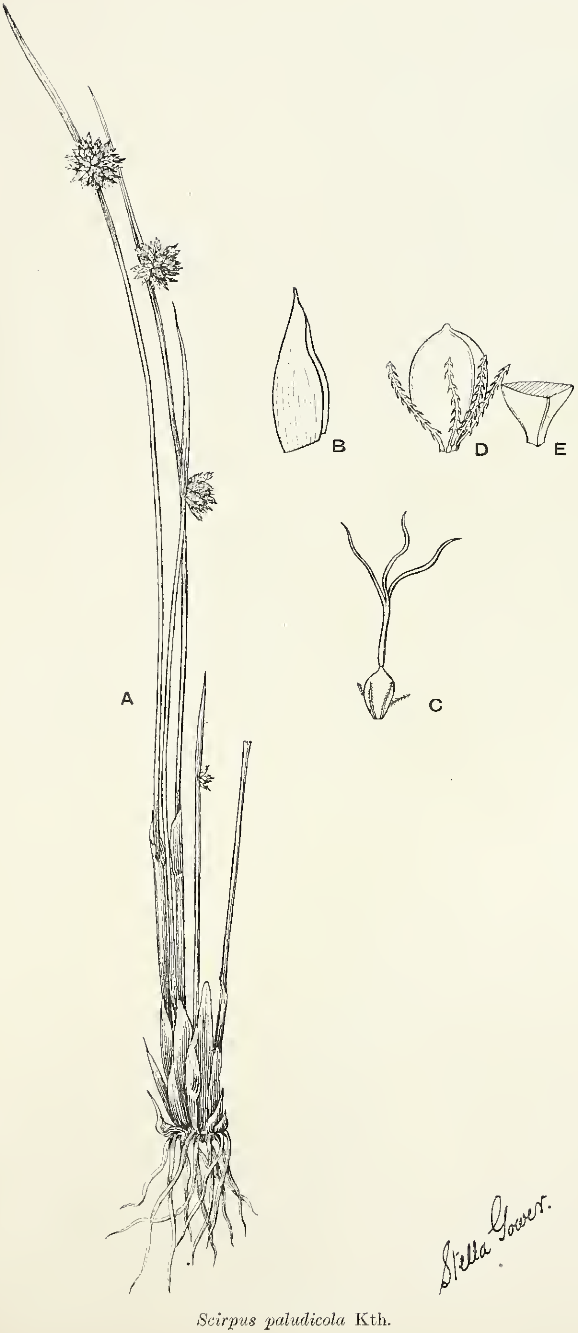


Scirpus membranaceus Thunb.

Plate XXXVIII.



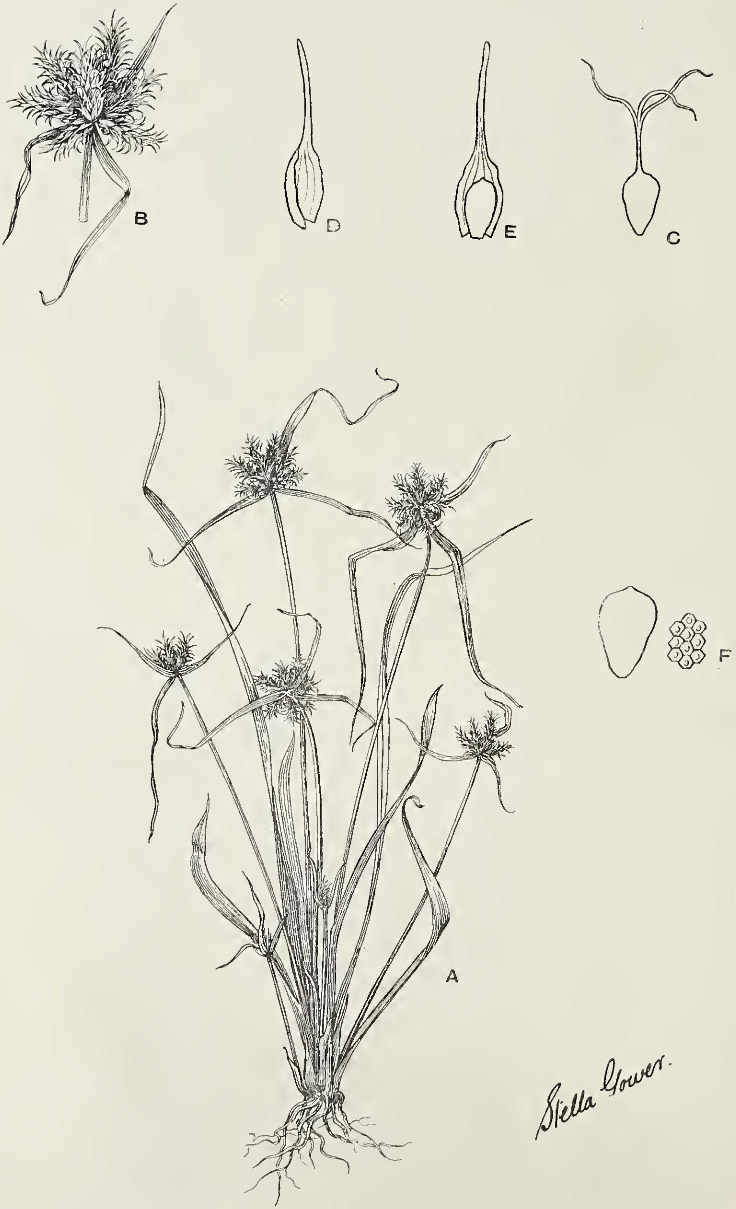
Scirpus falsus C. B. Cl.



Stella Gower.

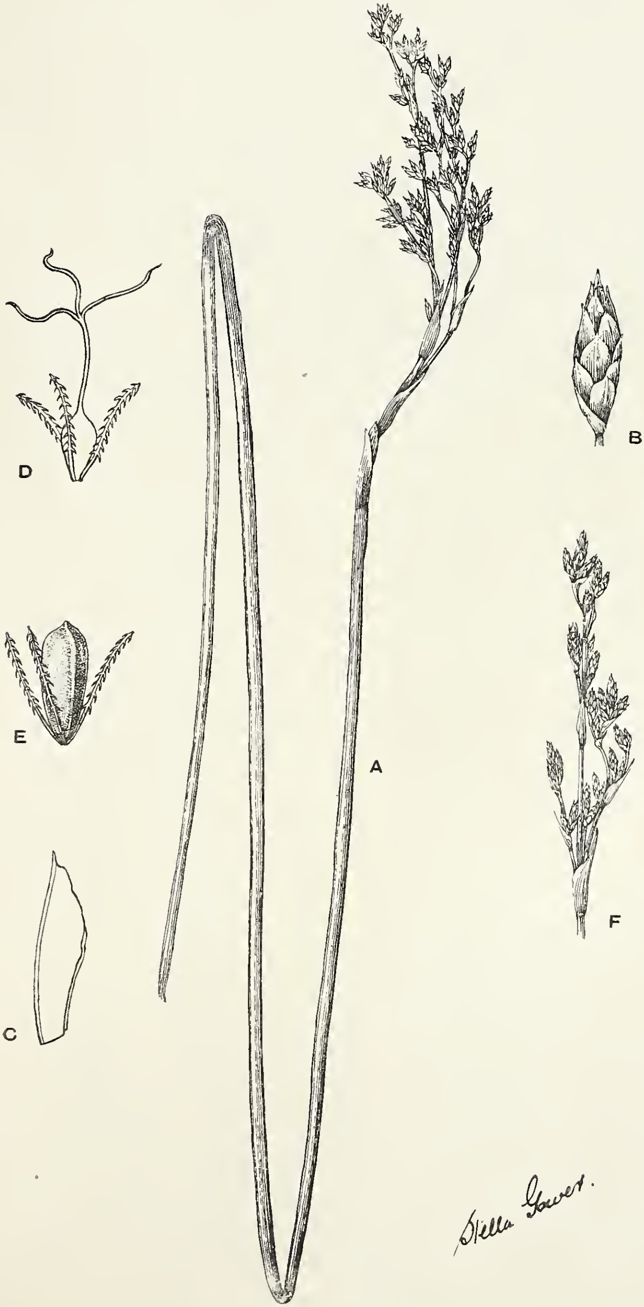
Scirpus paludicola Kth.

Plate XL.



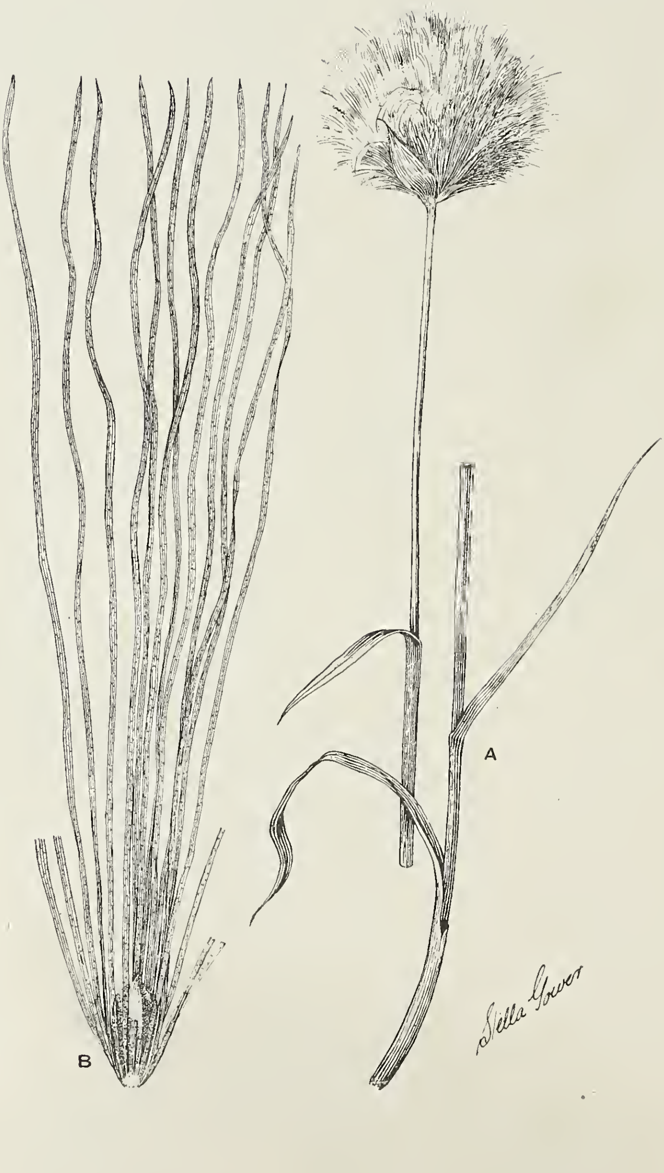
Scirpus hystrix Thunb.

Plate XLI.



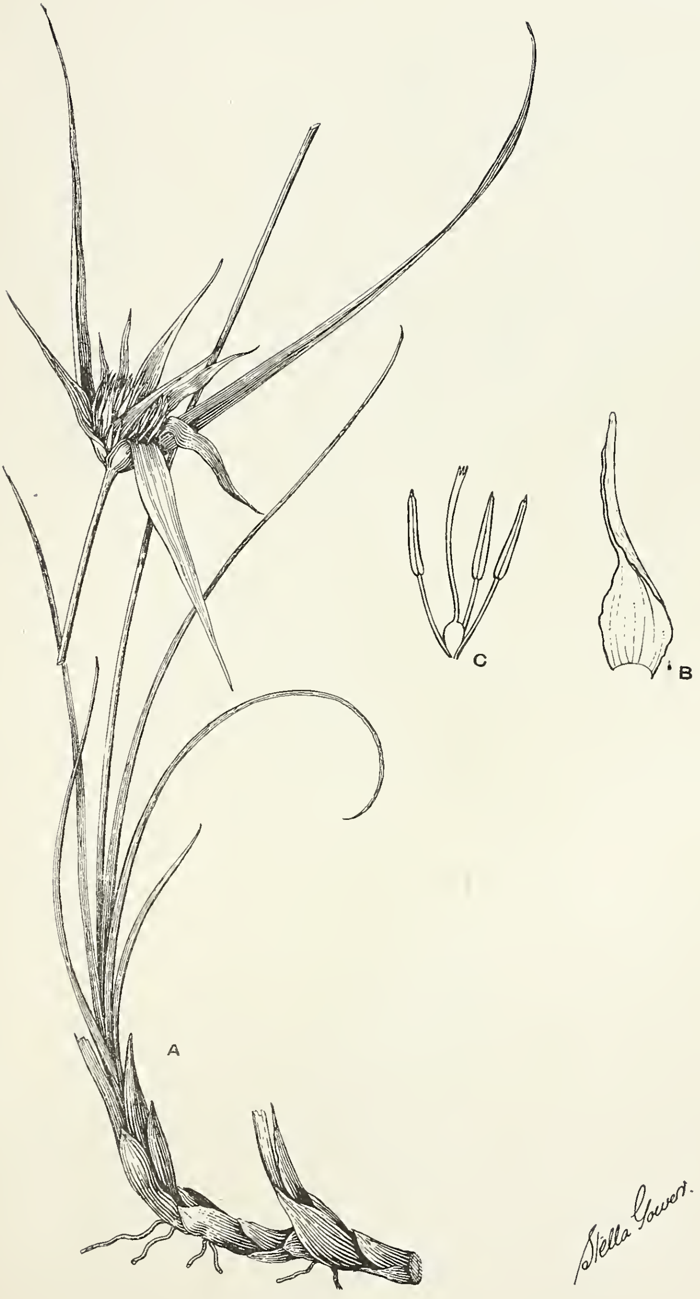
Scirpus spathaceus Hochst.

Plate XLII.



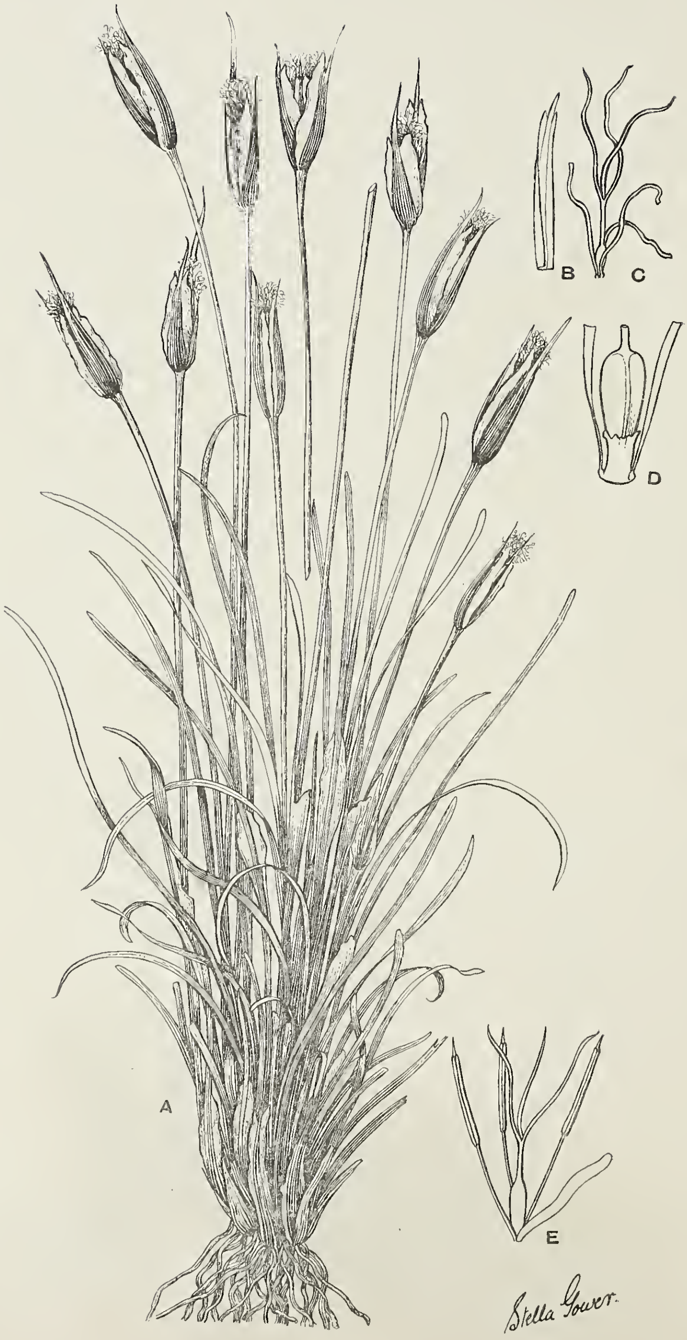
Eriophorum angustifolium Roth.

Plate XLIII.



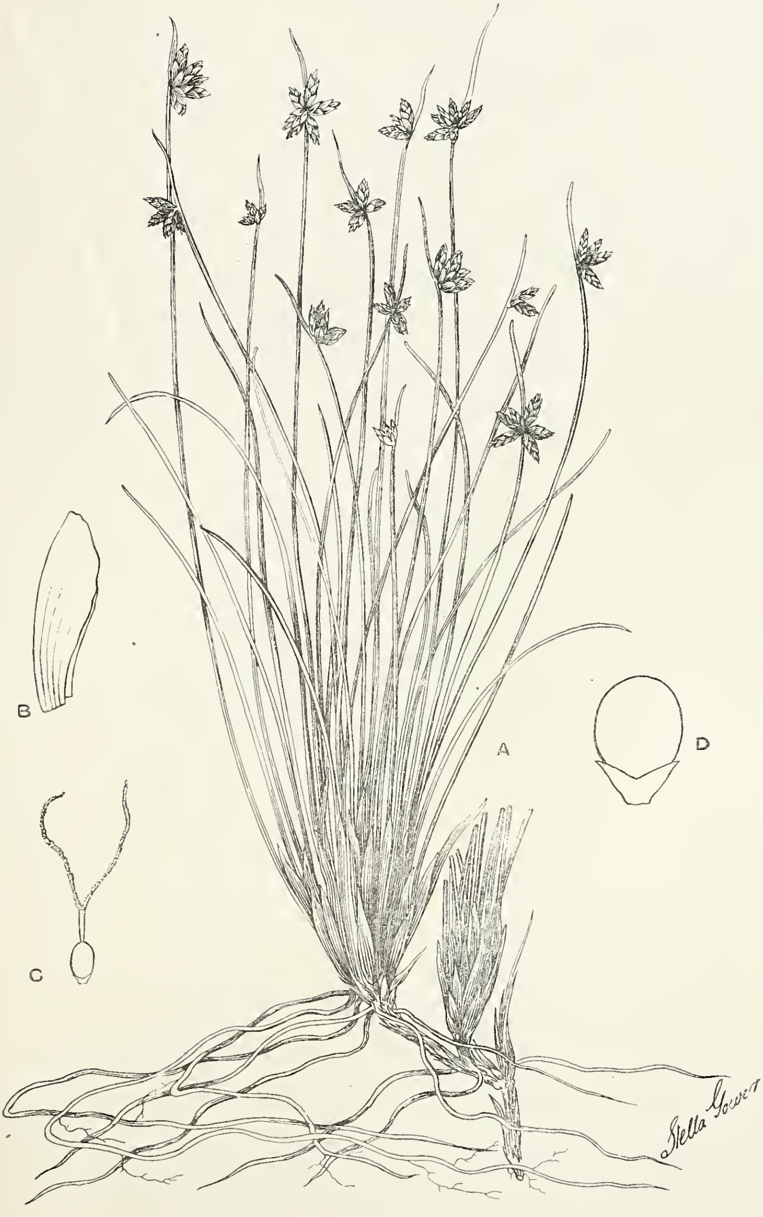
Ficinia radiata Kth.

Plate XLIV.



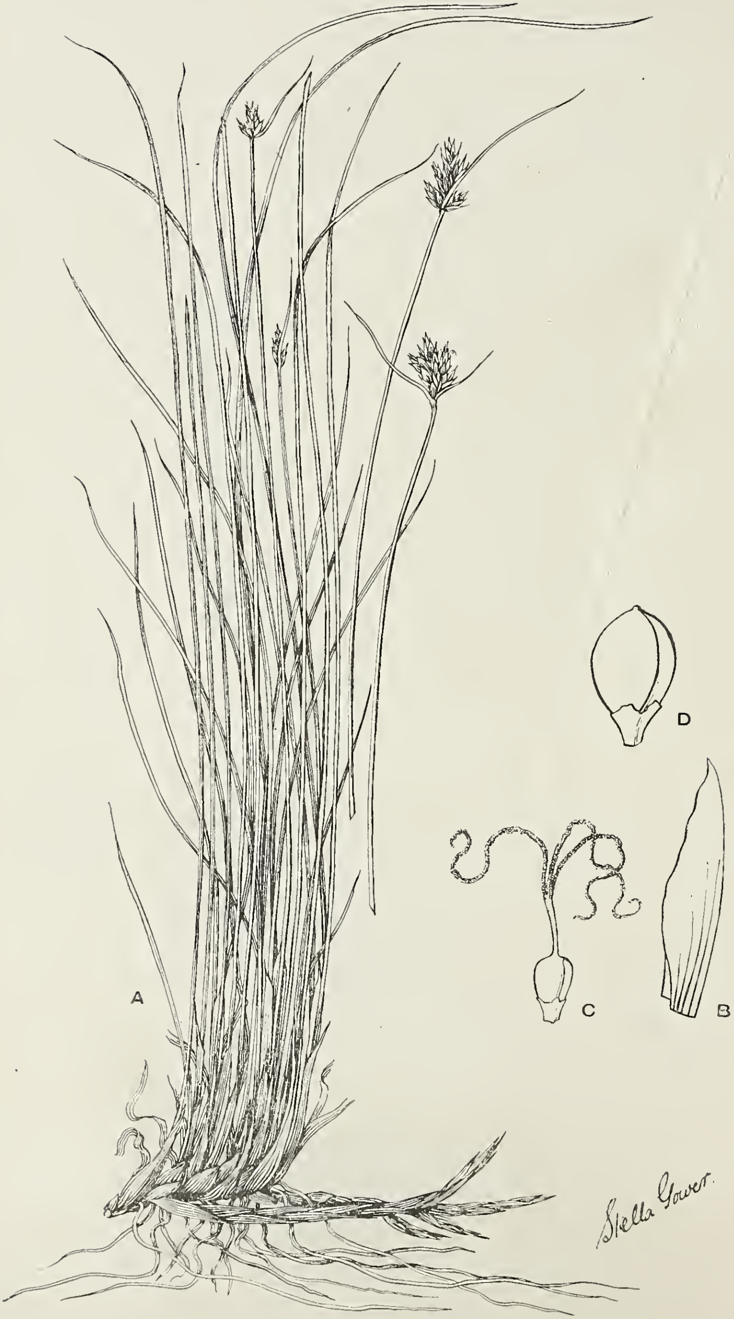
Ficinia ixioides Nees.

Plate XLV.



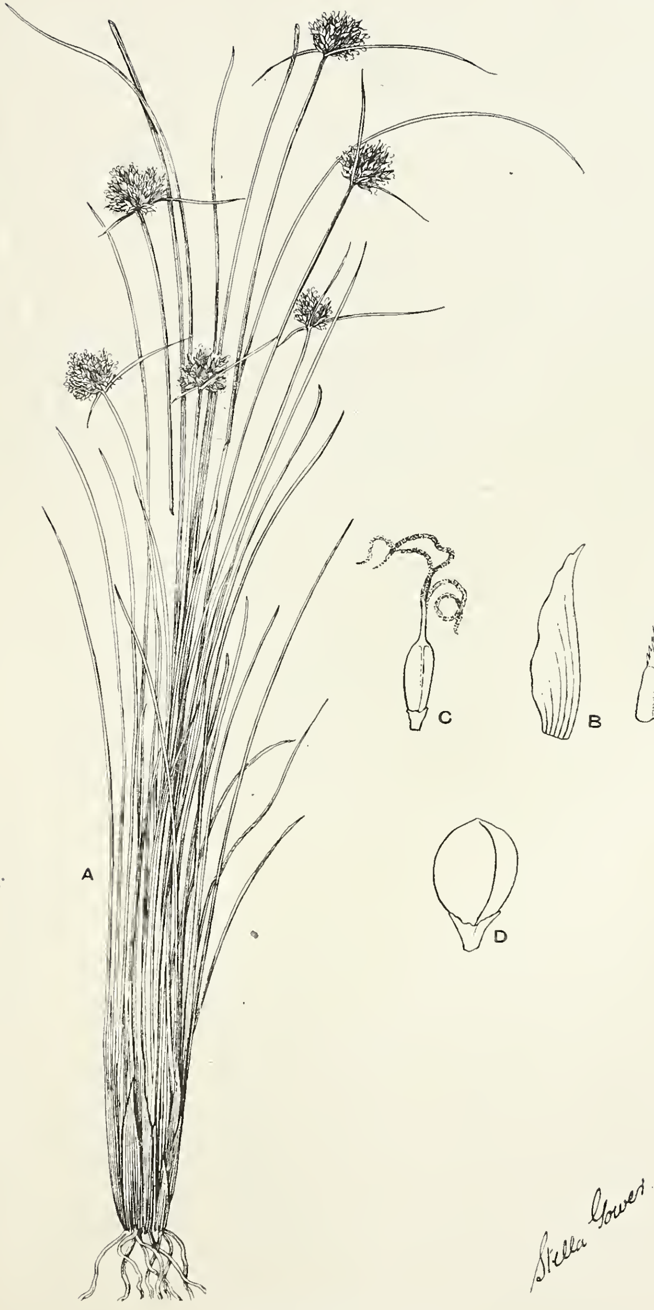
Ficinia lateralis Kth.

Plate XLVI.



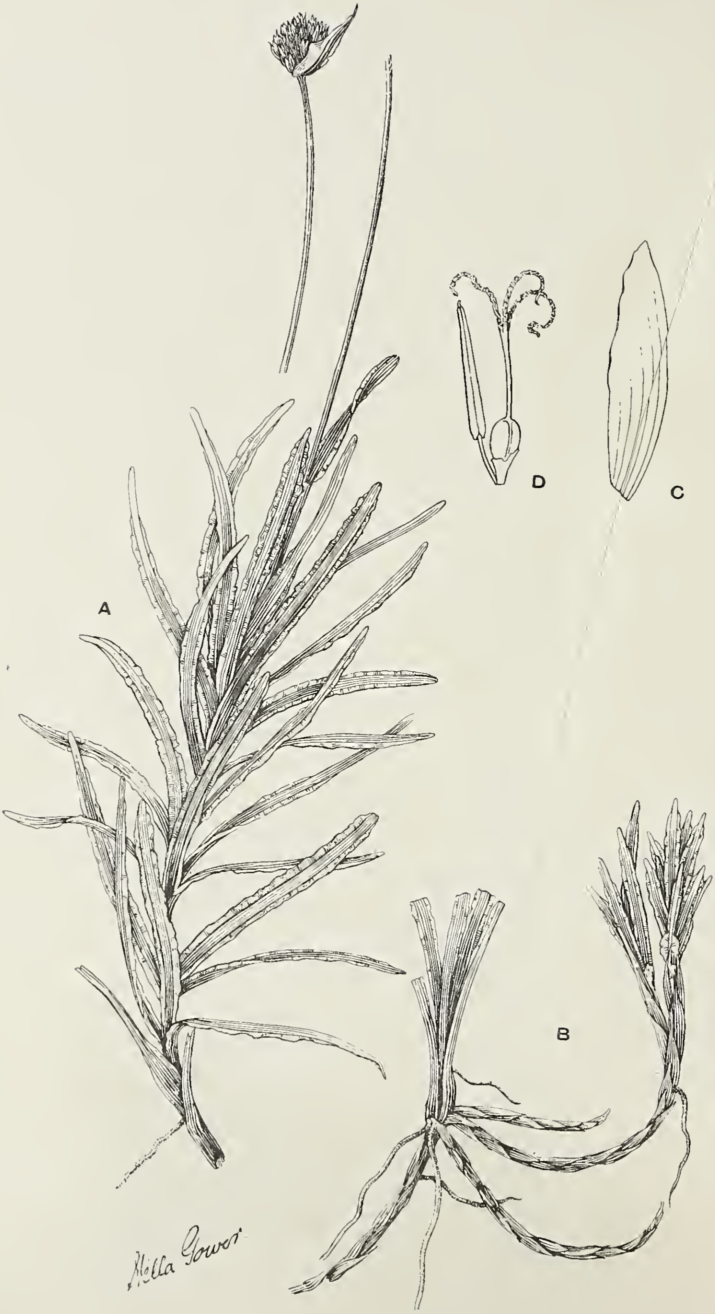
Ficinia stolonifera Boeck.

Plate XLVII.

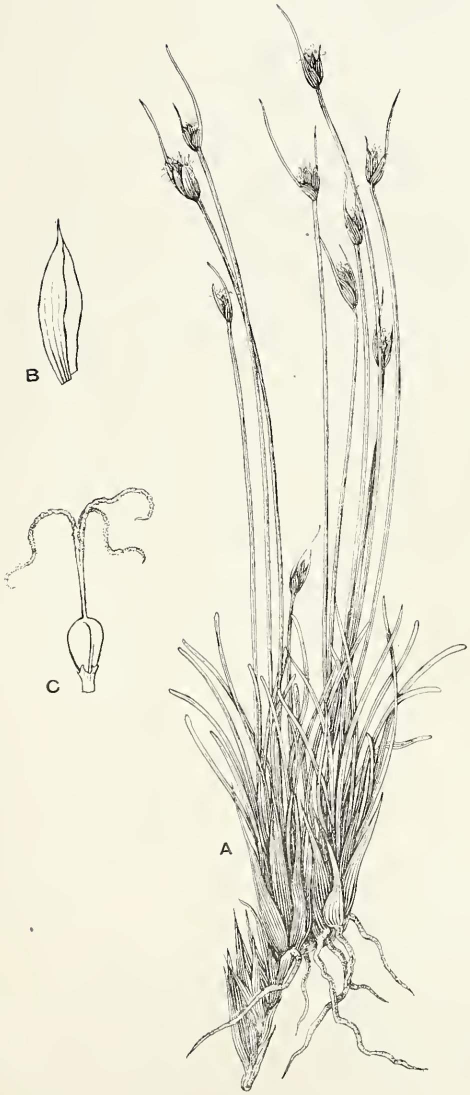


Ficinia MacOwani C. B. Cl.

Plate XLVIII.

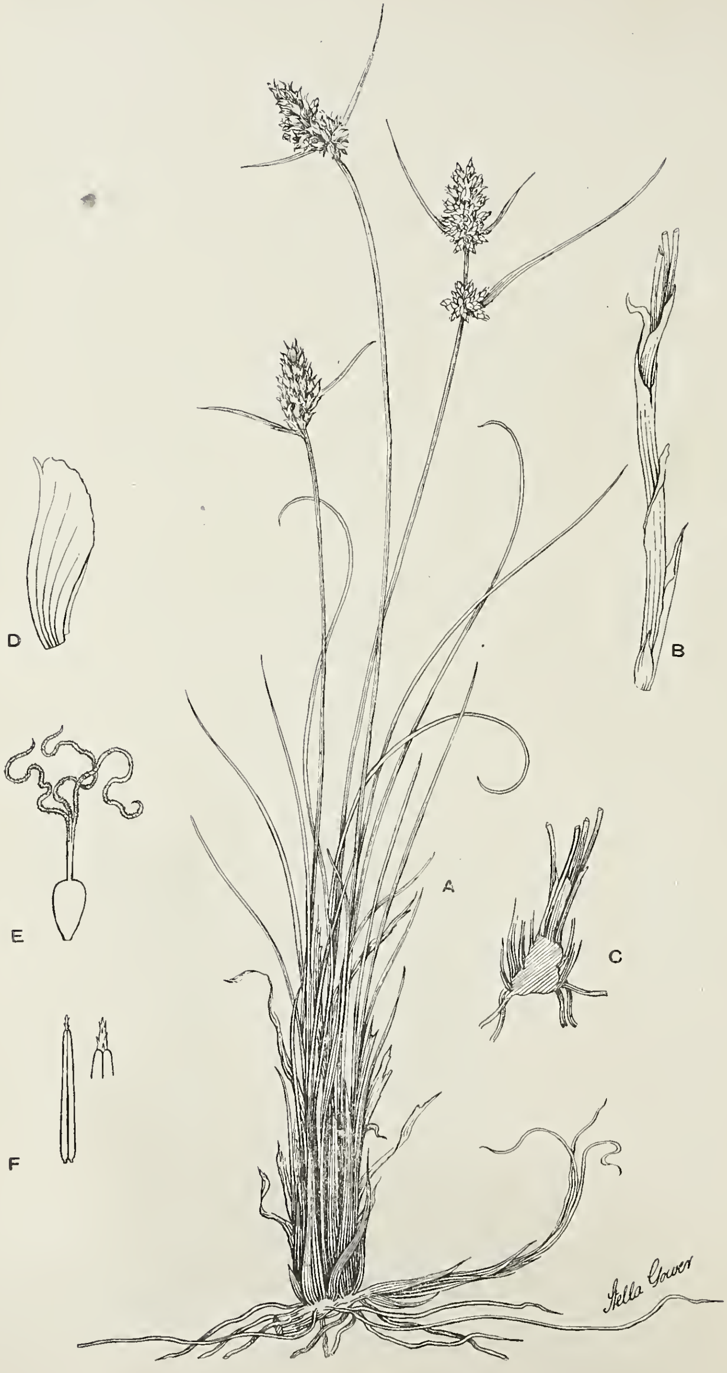


Ficinia truncata Schrad.



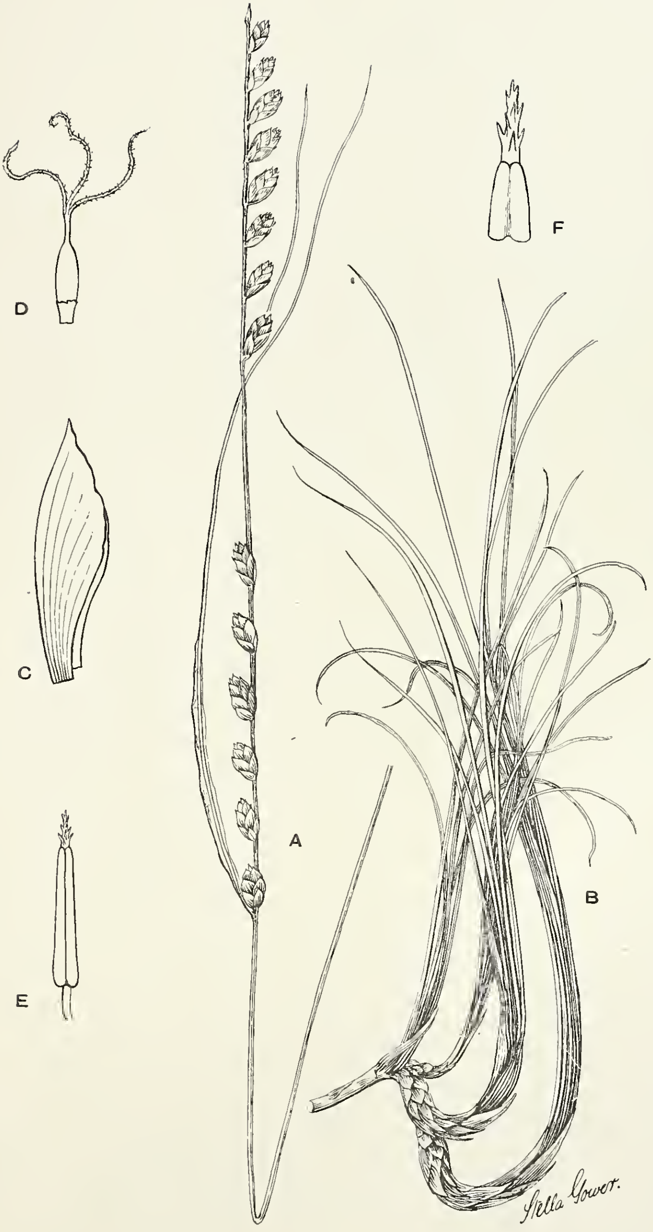
Stella Gower.

Ficinia striata (Thbg.) Kth. (*F. setiformis* Schrad.)

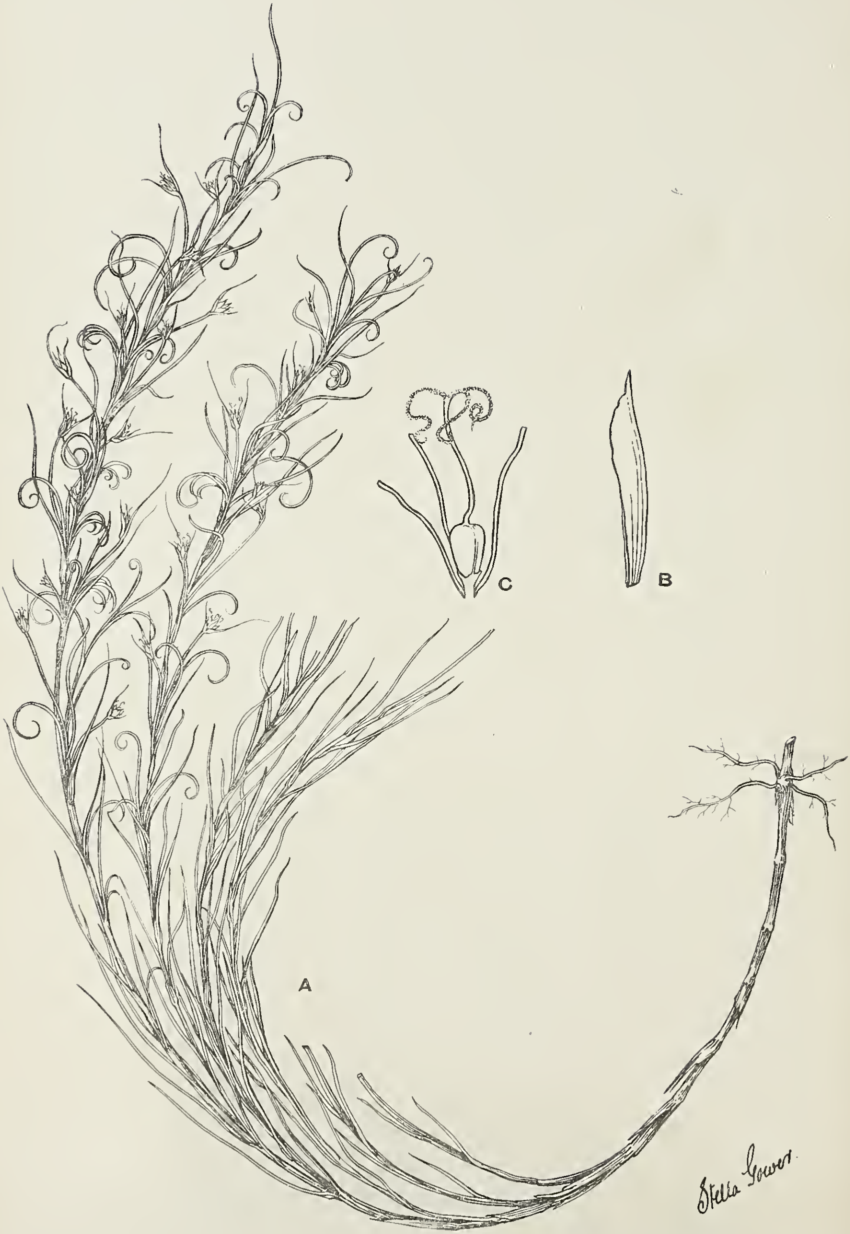


Ficinia bulbosa Nees.

Plate LI.

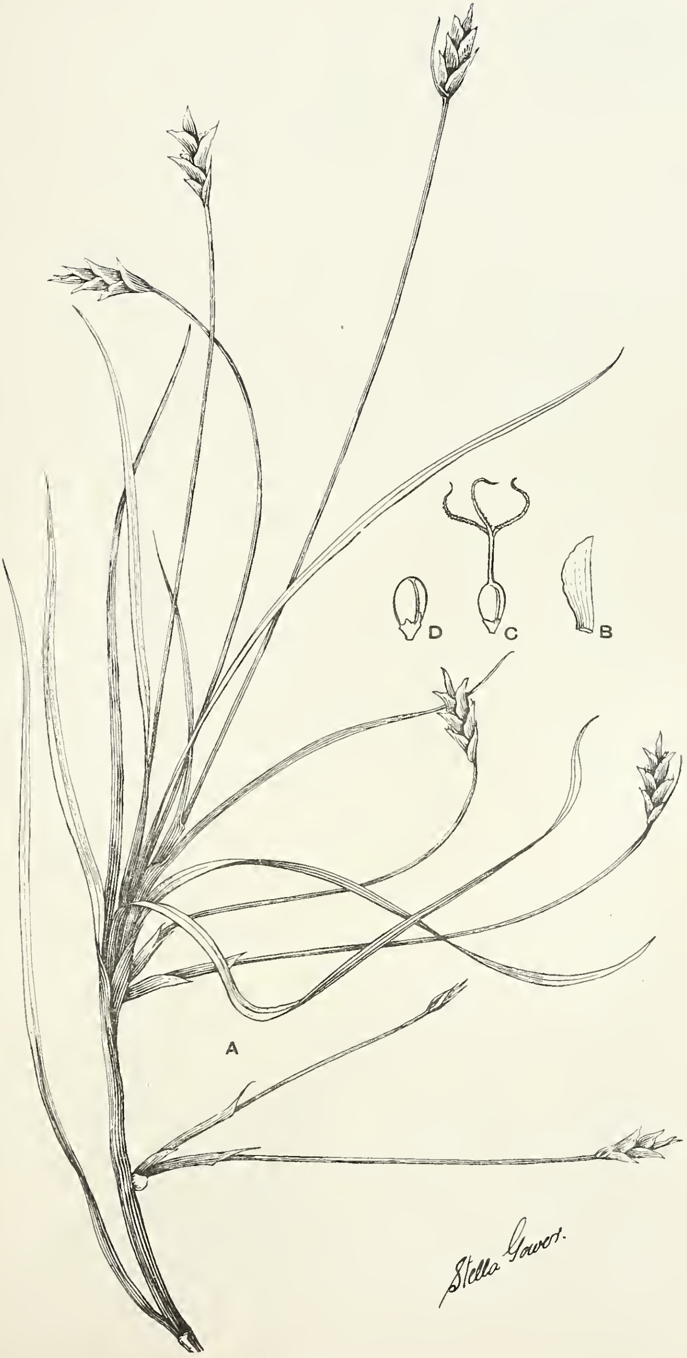


Ficinia secunda Ktn



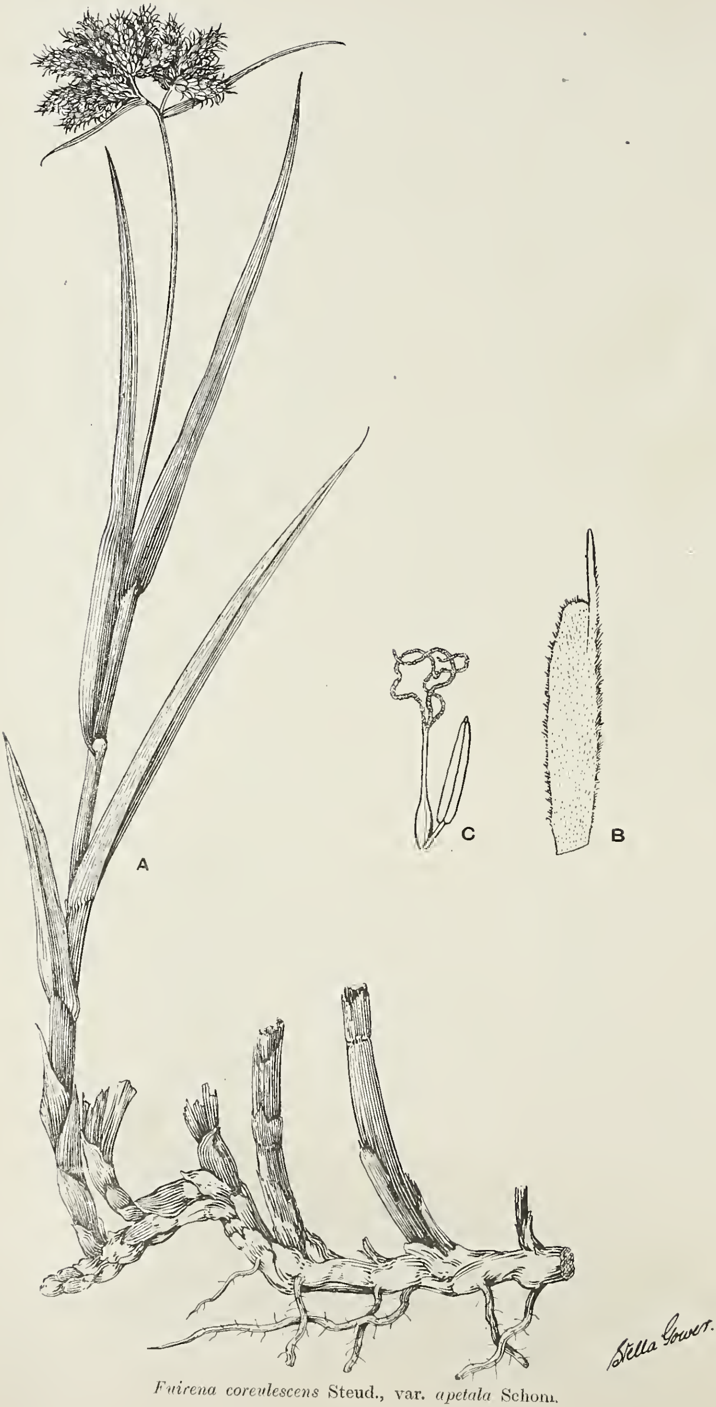
Ficinia trichodes (Schrad.) Benth.

Plate LIII.



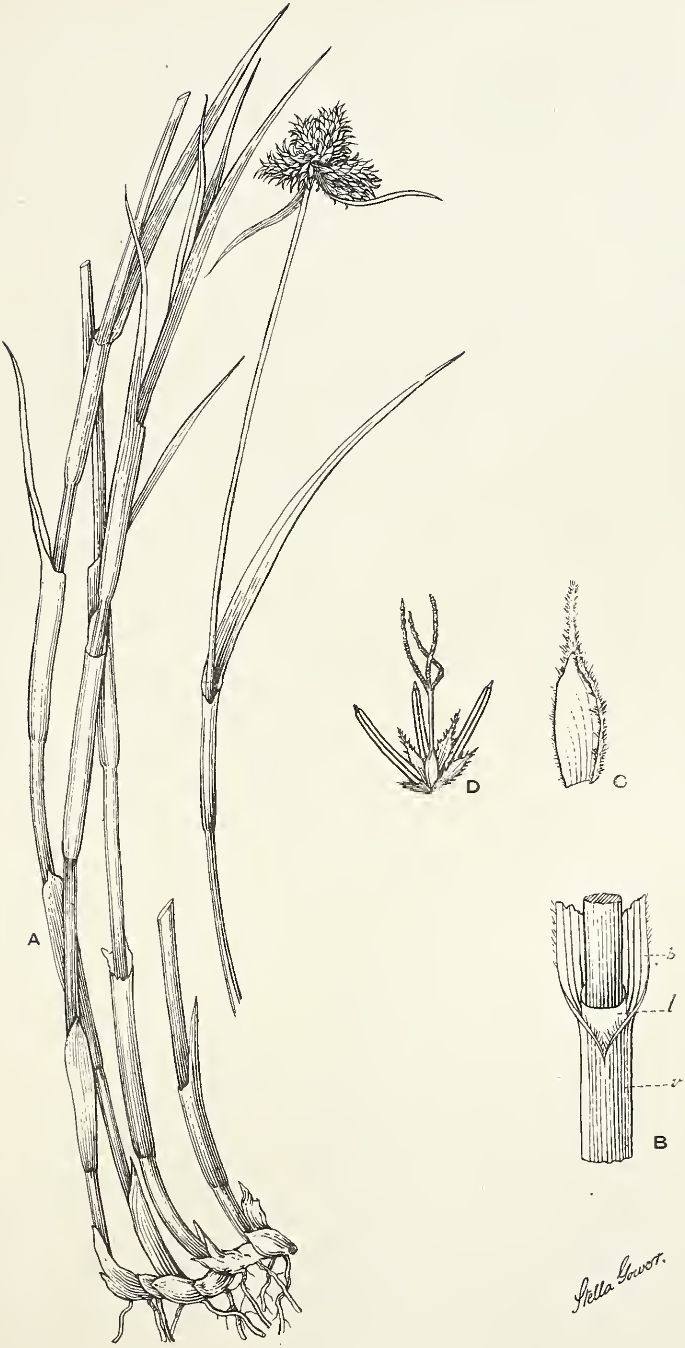
Ficinia longifolia C. B. Cl.

Plate LIV.



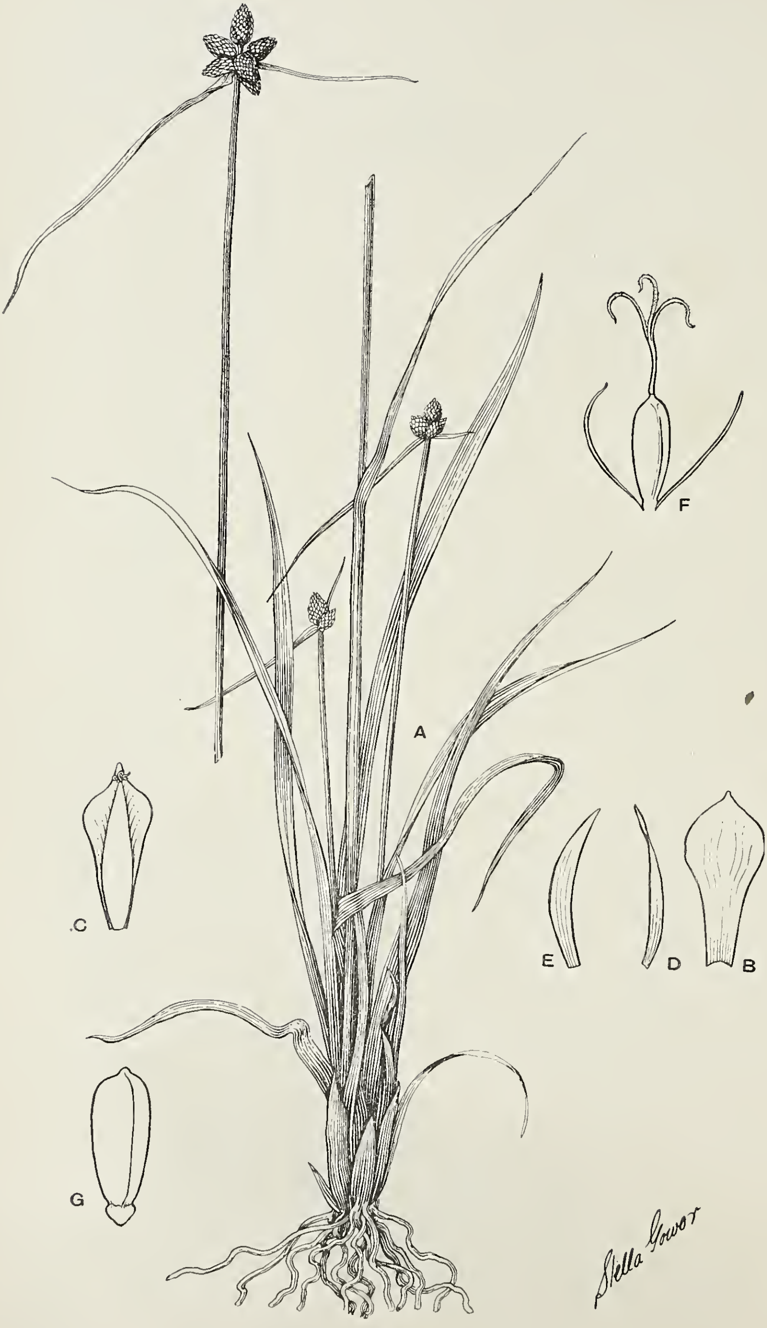
Fuirena coreulescens Steud., var. *apetala* Schonl.

Plate LV.



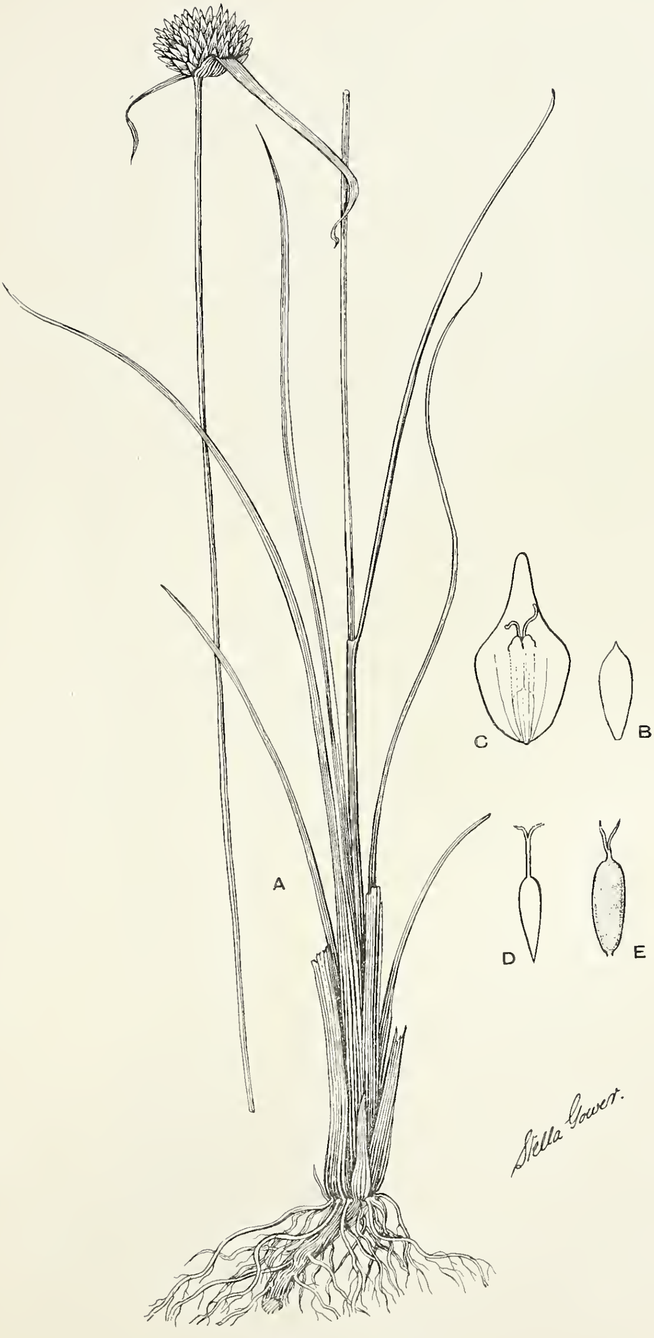
Fuirena hirta Vahl

Plate LVI.



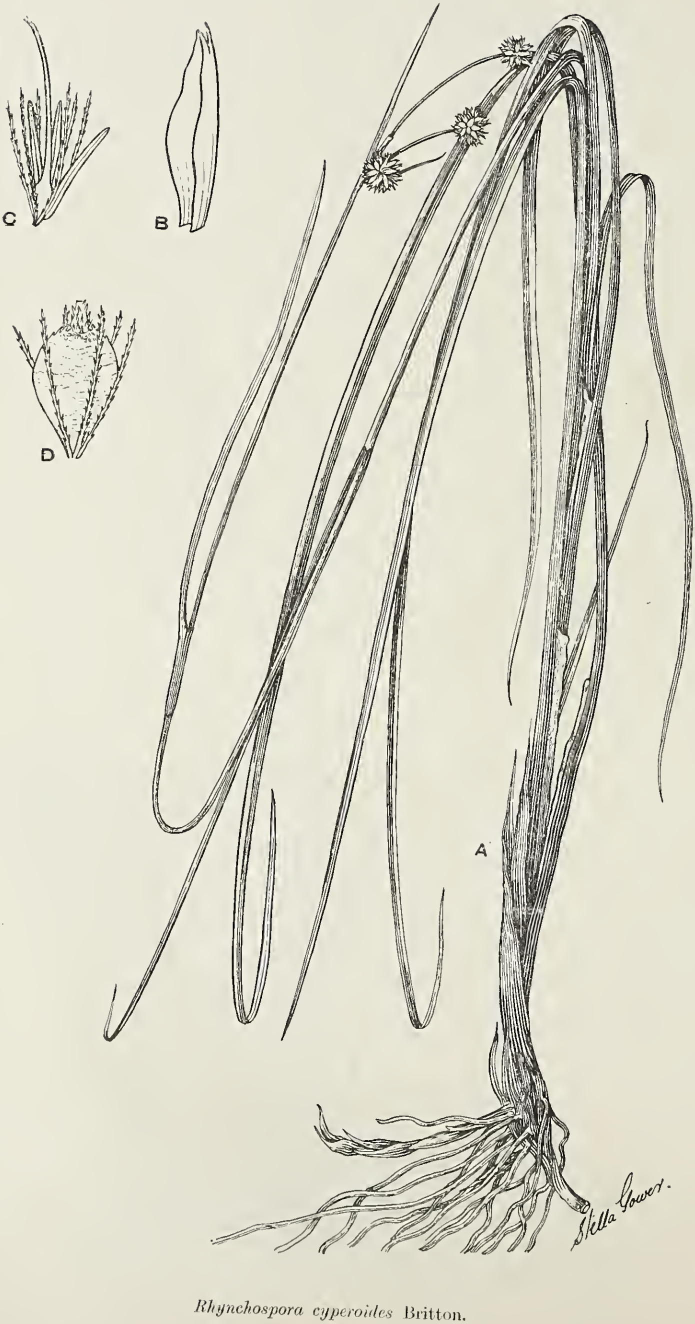
Stella Gower

Lipocarpha argentea R. Br.



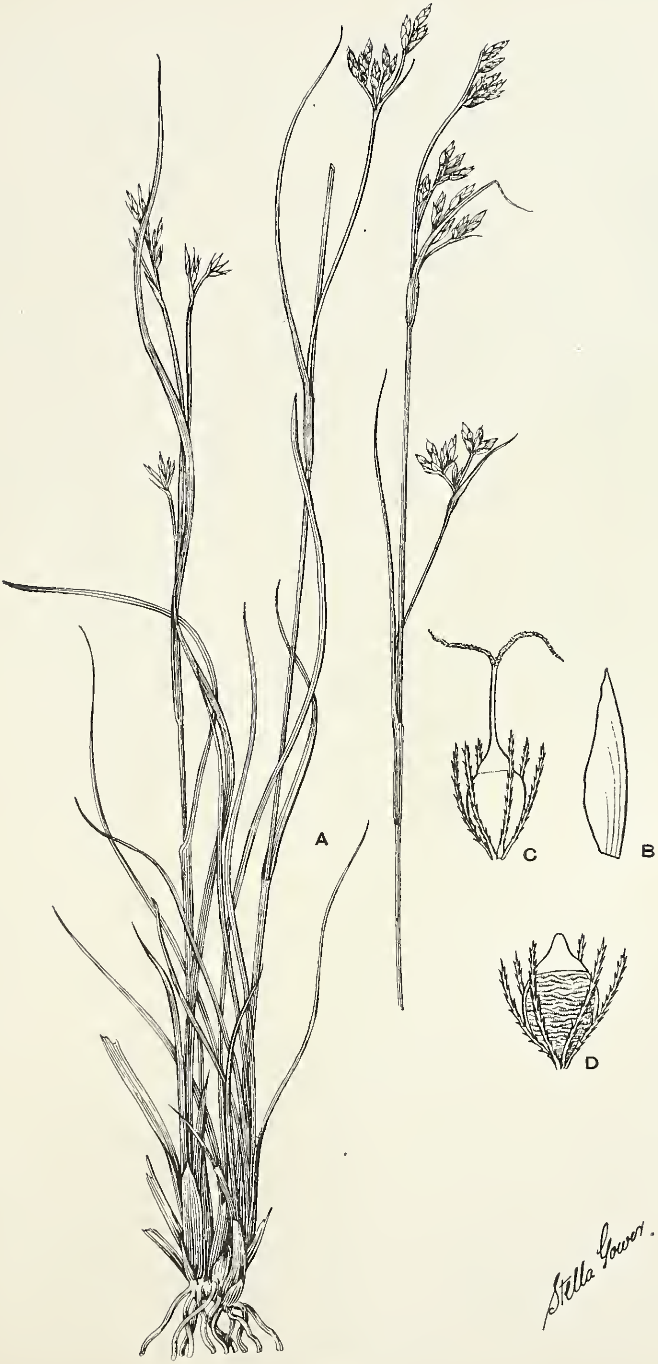
Ascolepis capensis Ridley.

Plate LVIII.

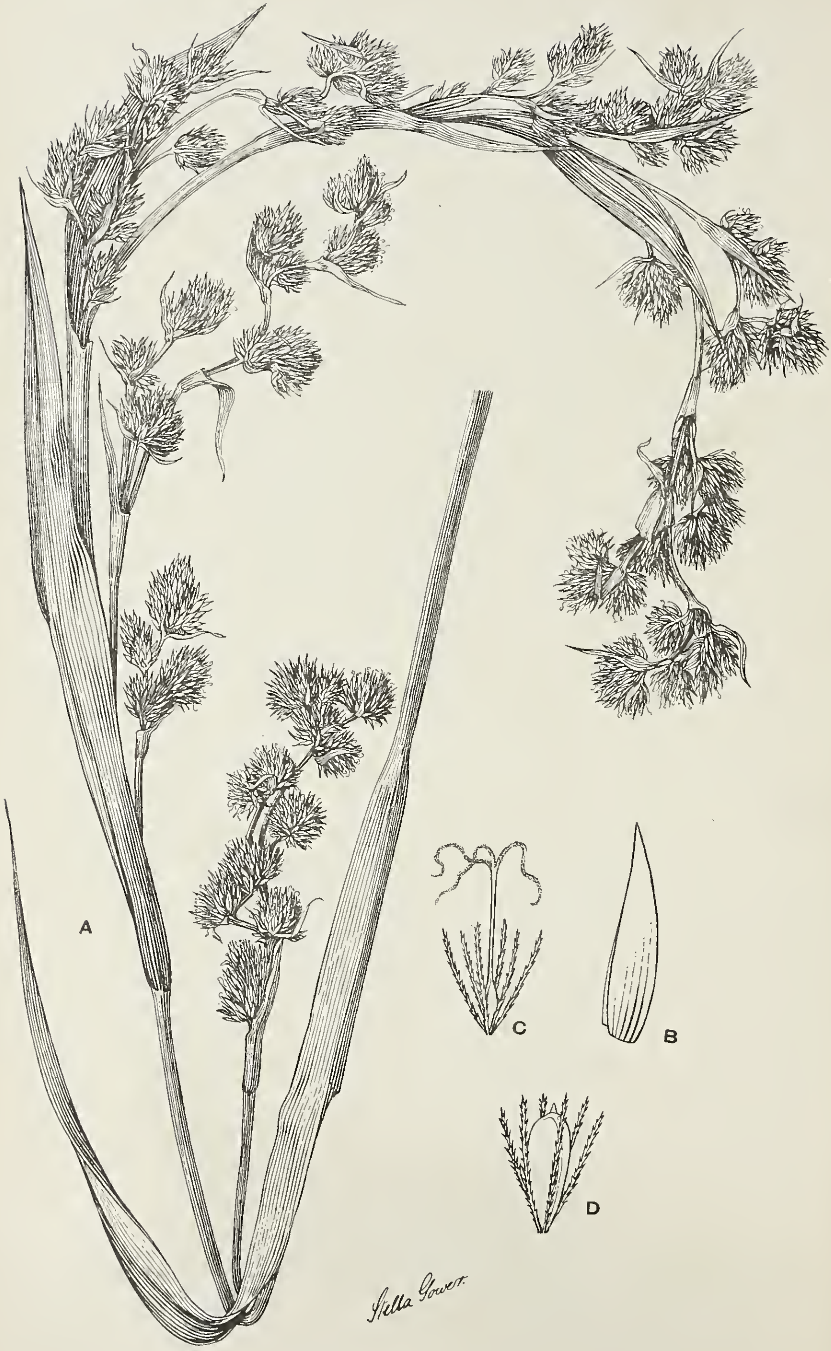


Rhynchospora cyperoides Britton.

Plate LIX.

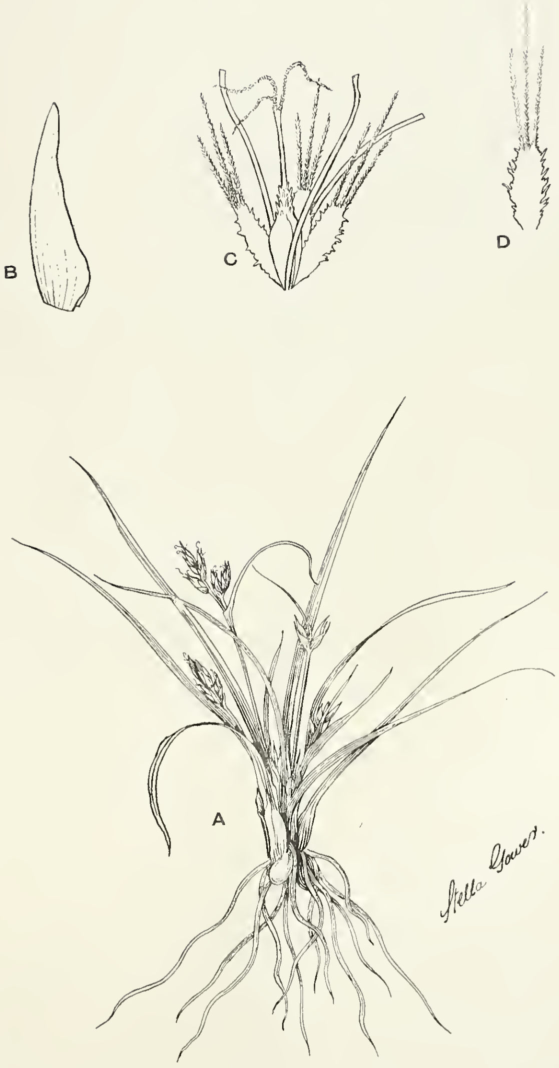


Rhynchospora glauca Vahl.



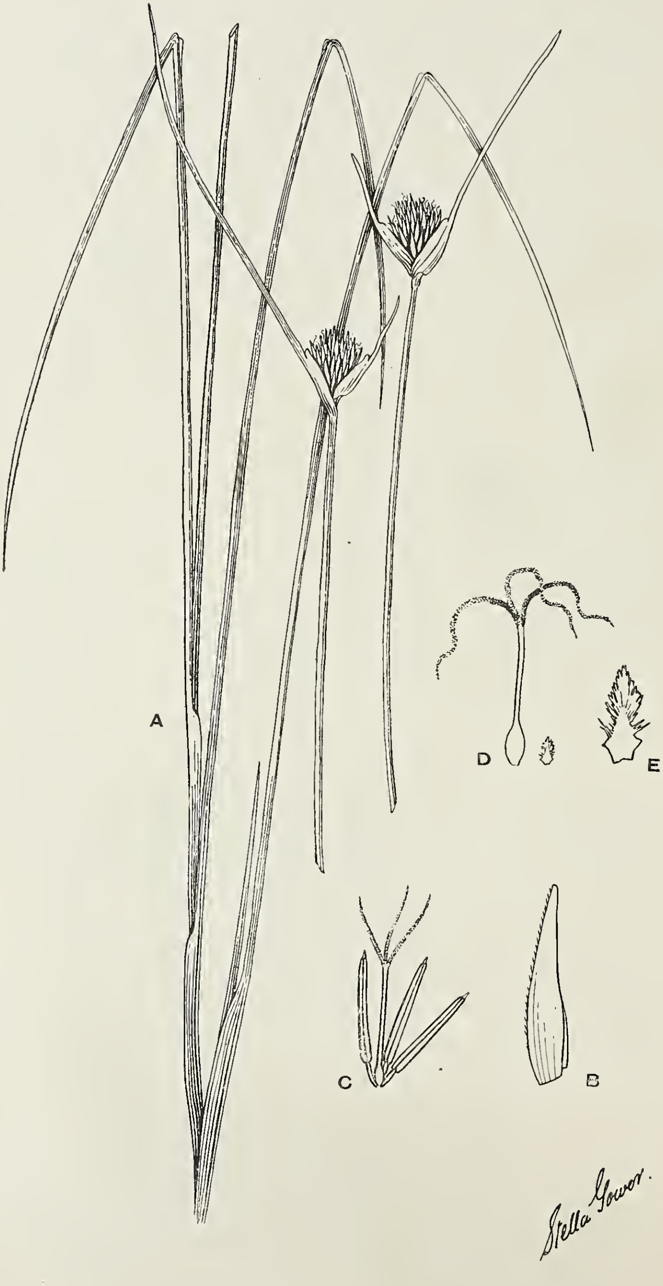
Carpha glomerata Nees.

Plate LXI.



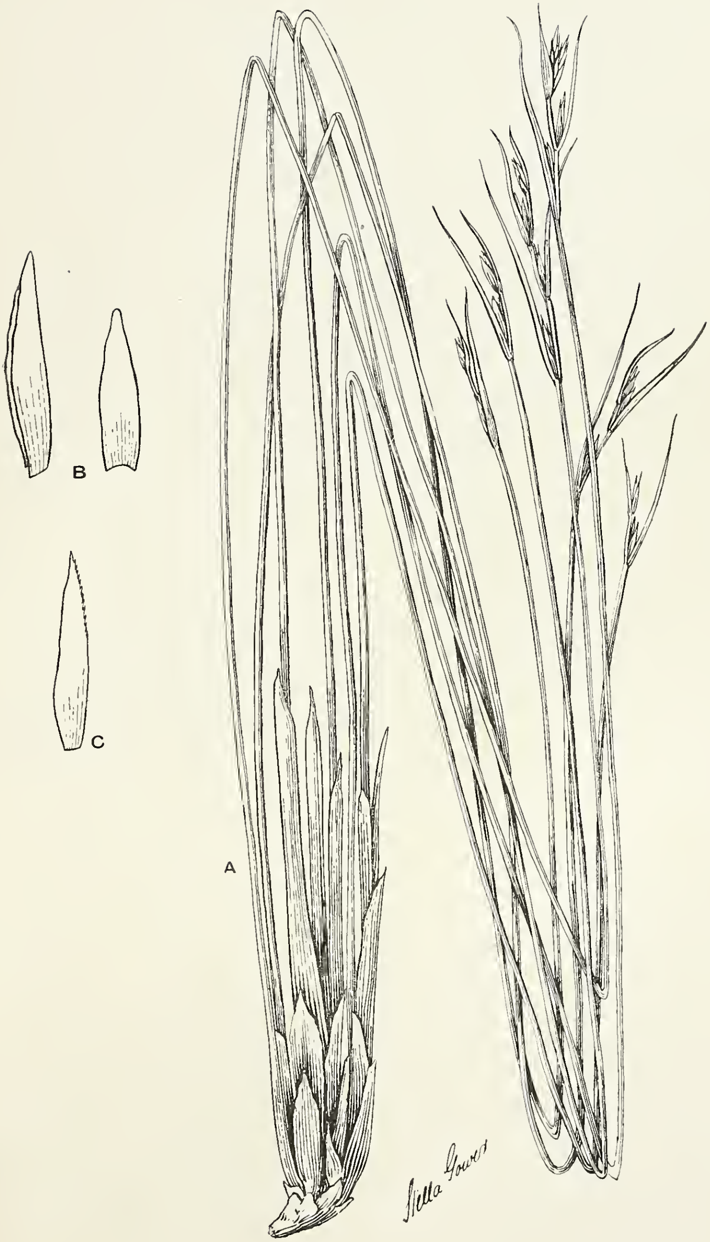
Ecklonia capensis Steud.

Plate LXII.



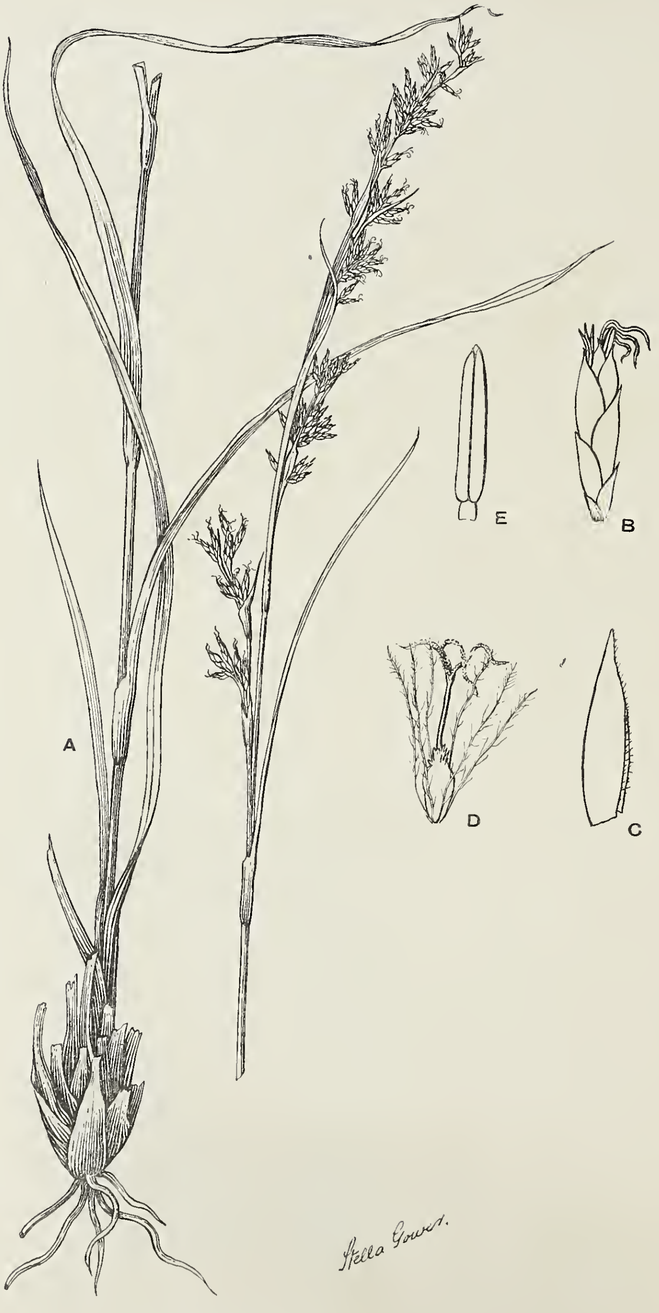
Schoenus nigricans L.

Plate LXIII.

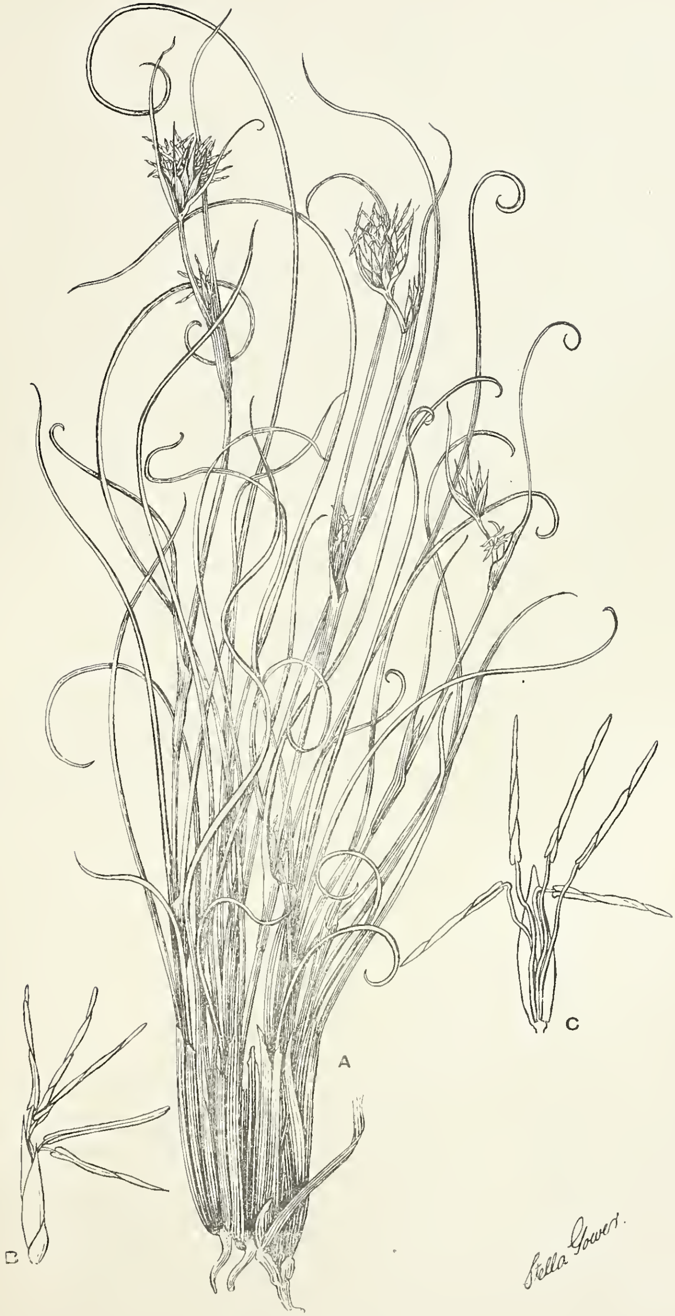


Epischoenus quadrangularis C. B. Cl.

Plate LXIV.

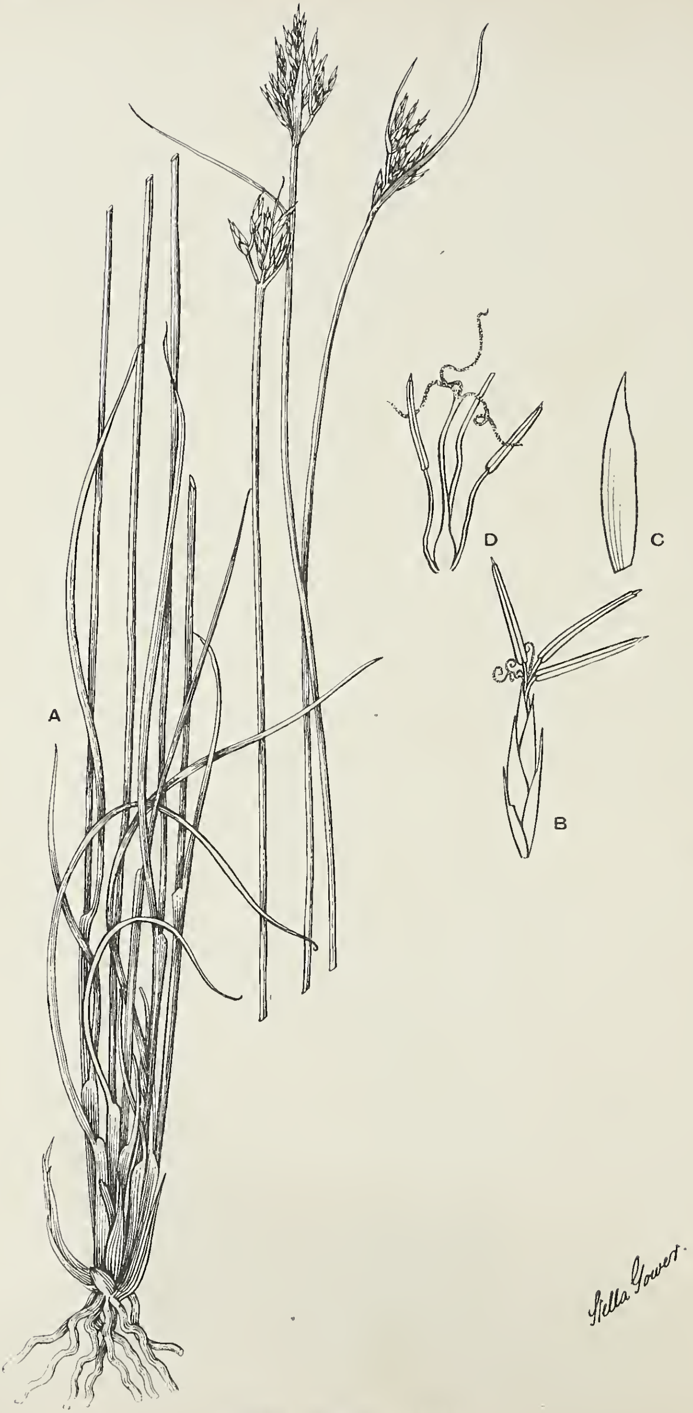


Costularia natalensis C. B. Cl.



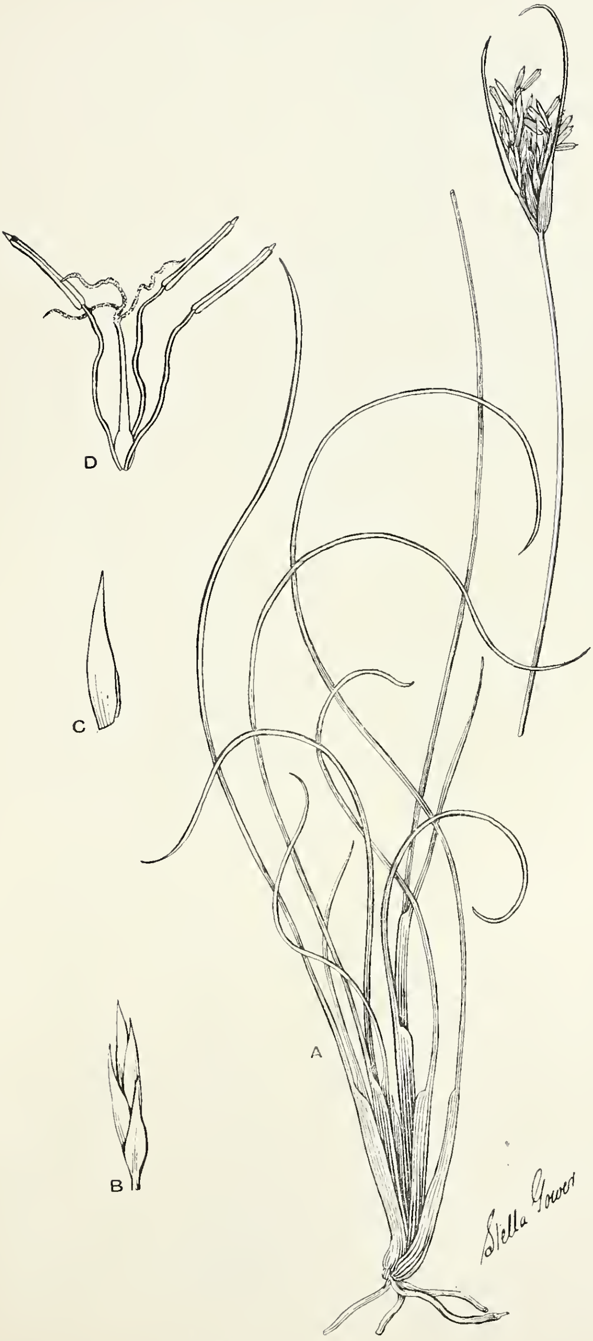
Stella Gower.

Tetraria crinifolia C. B. Cl.



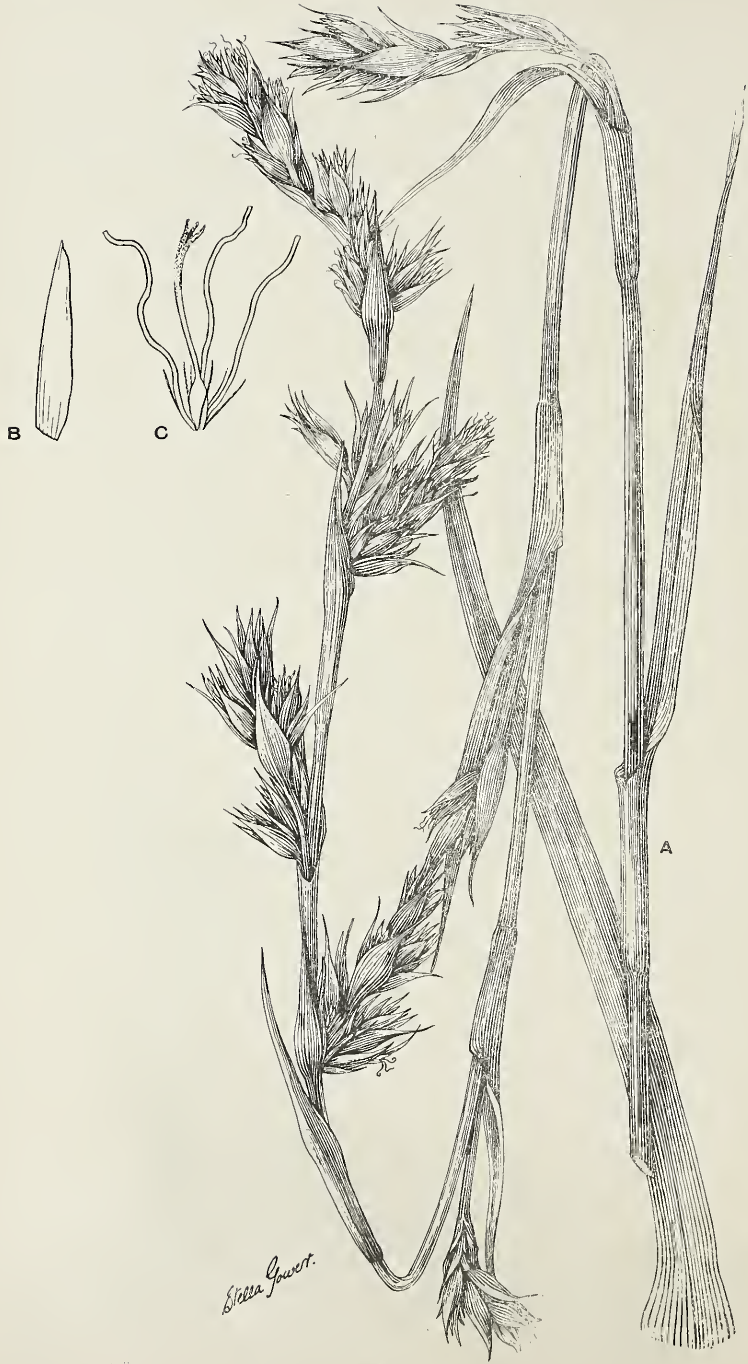
Tetraria cuspidata C. B. Cl.

Plate LXVII.



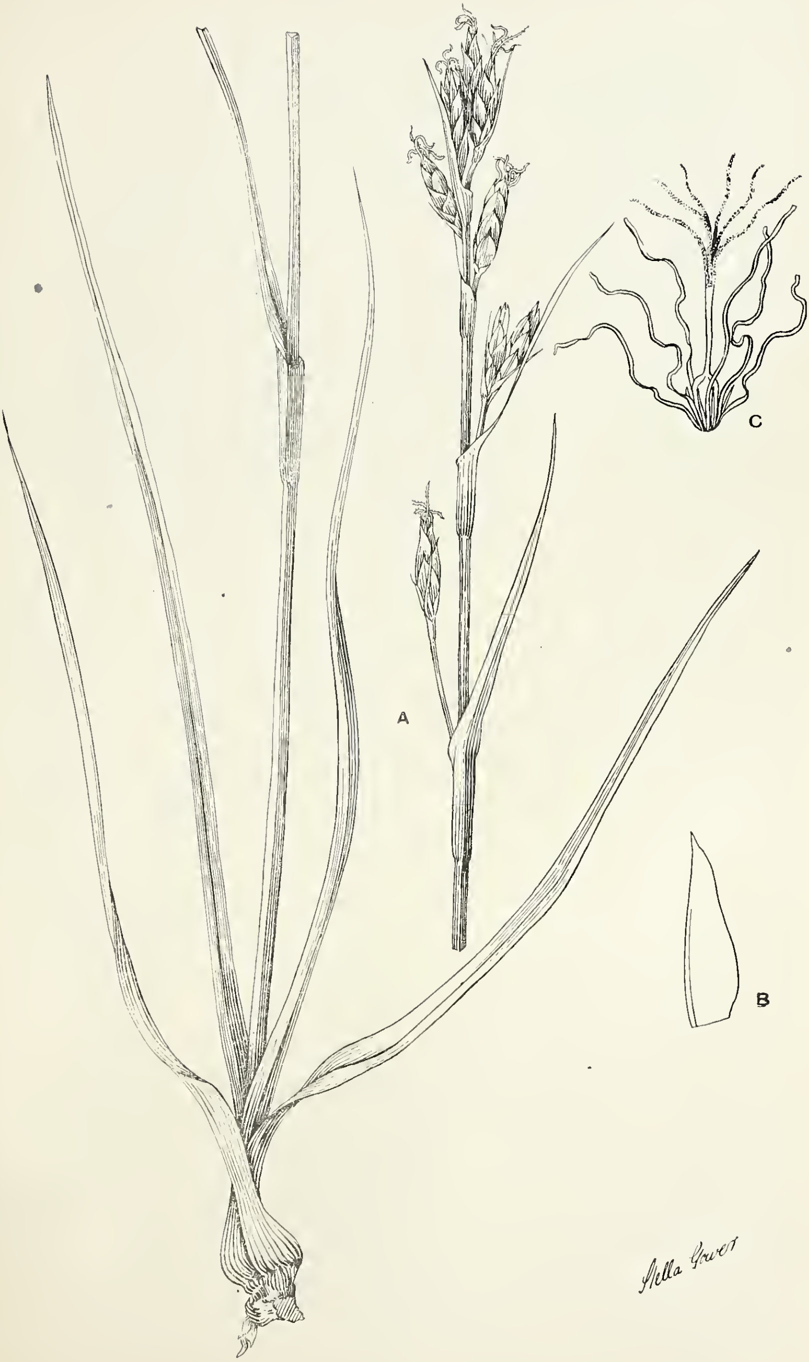
Tetraria sylvatica C. B. Cl.

Plate LXVIII.



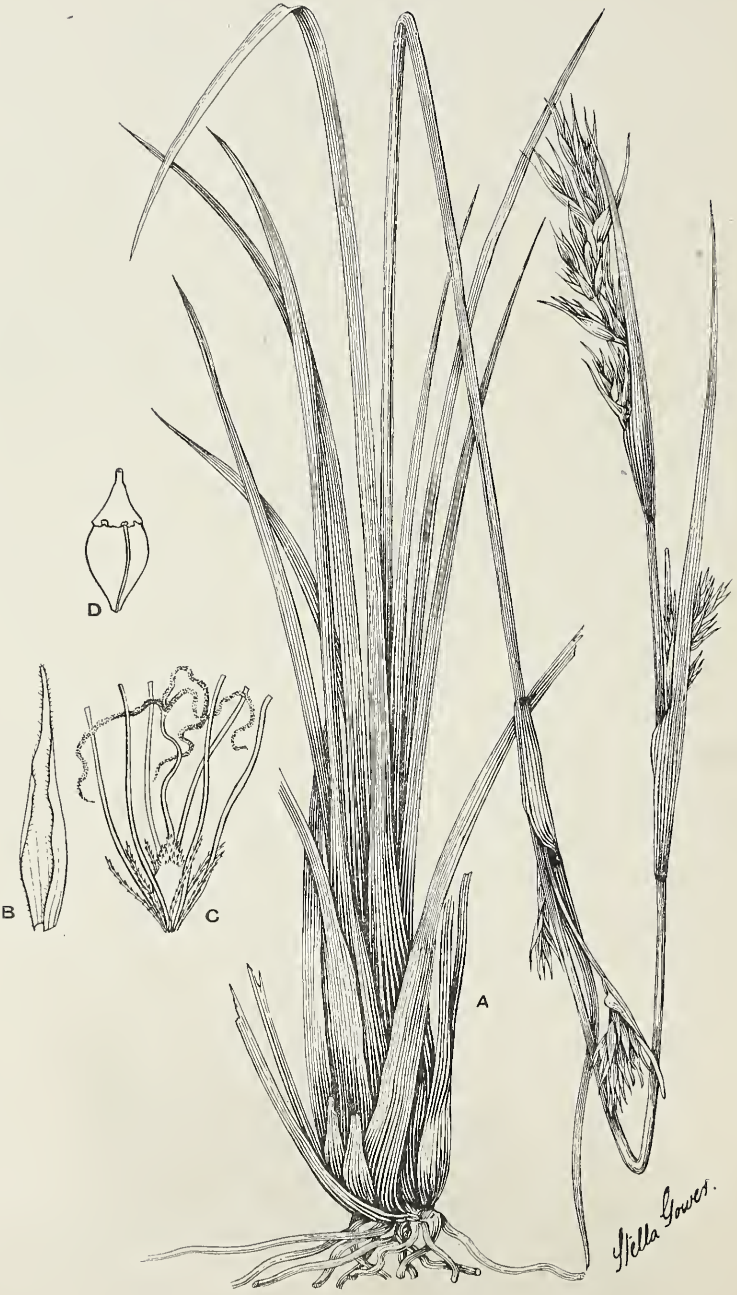
Tetraria thermalis C. B. Cl.

Plate LXIX.

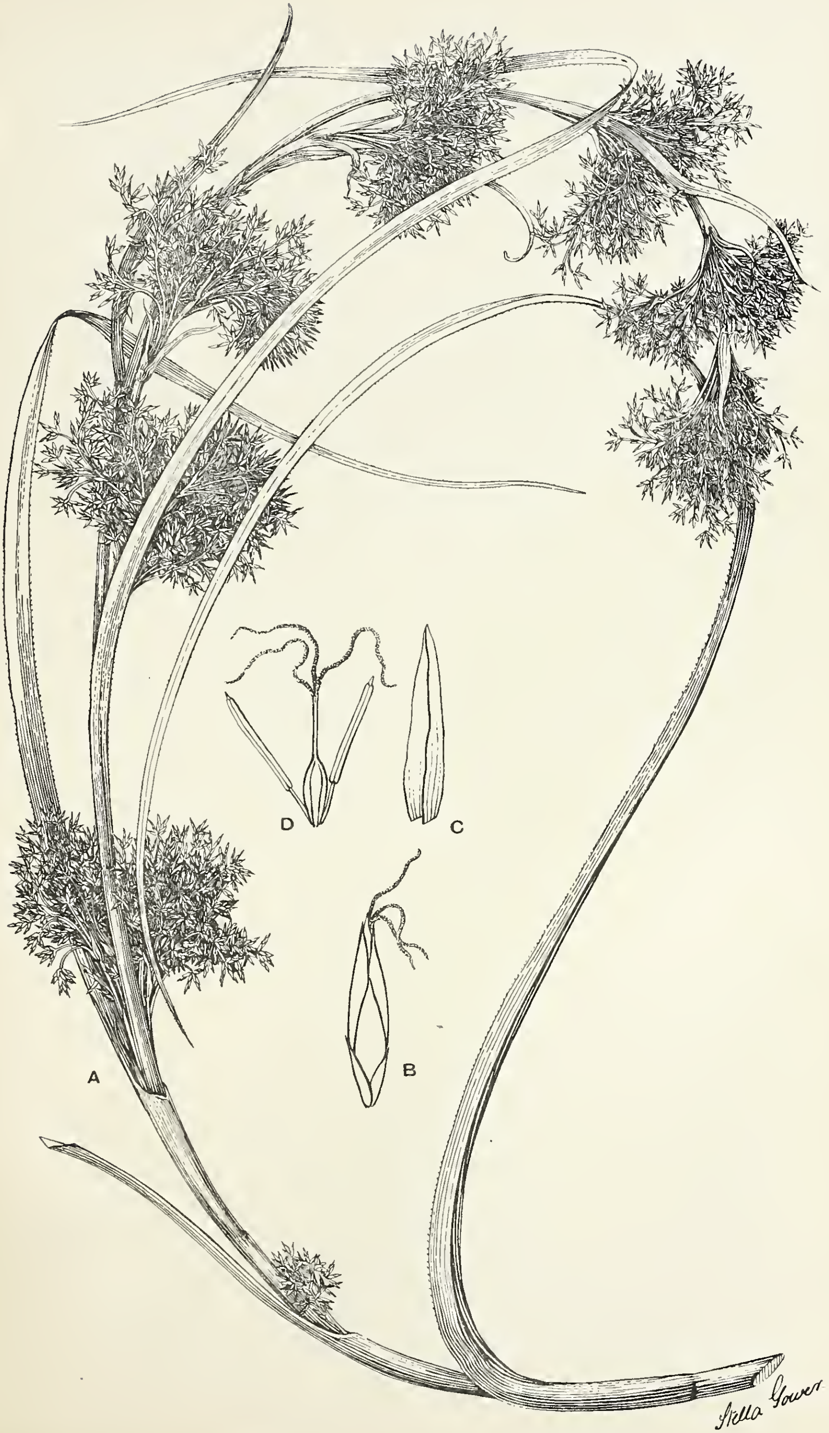


Tetraria MacOwani C. B. Cl.

Plate LXX.

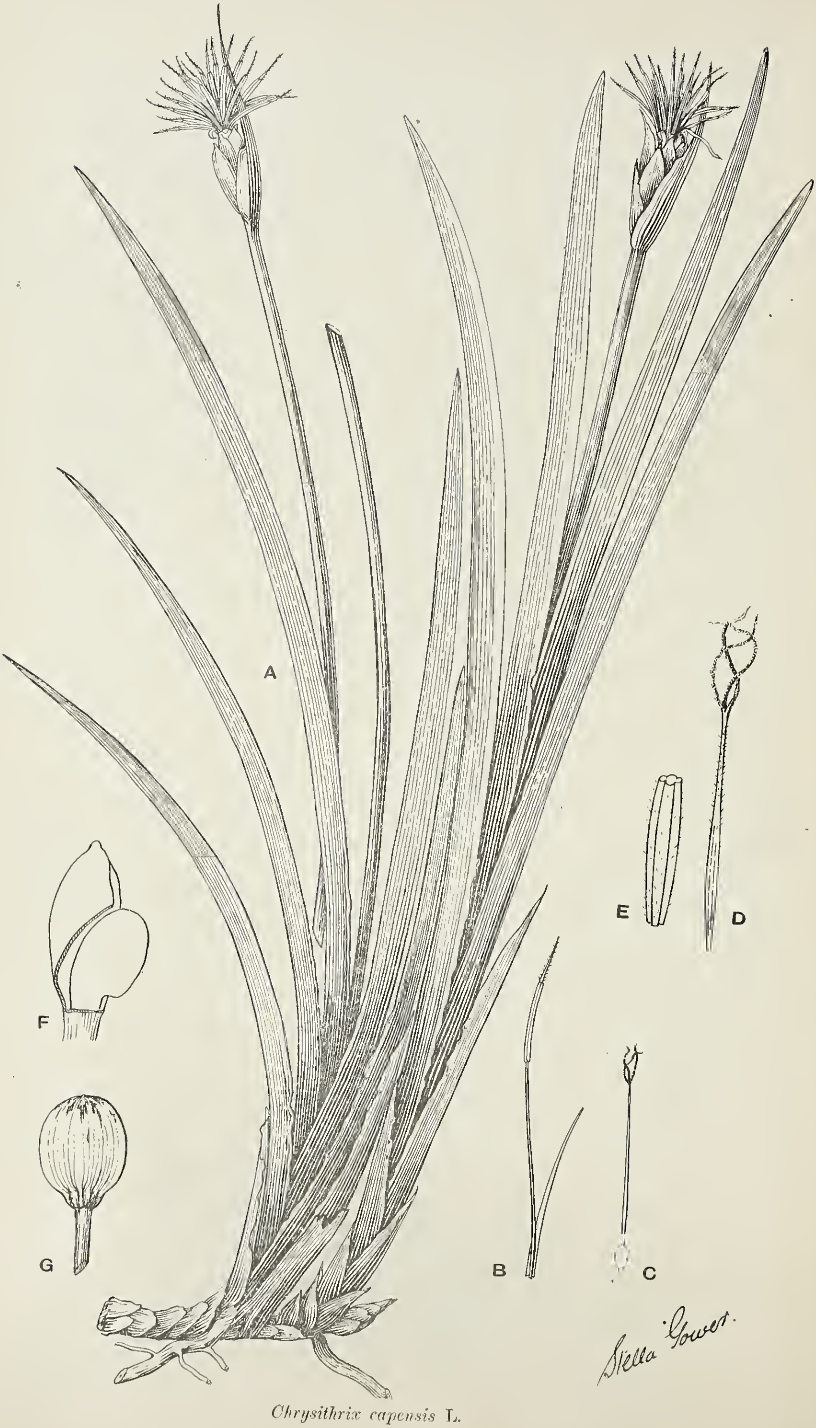


Macrochaetium Dregei C. B. Cl.



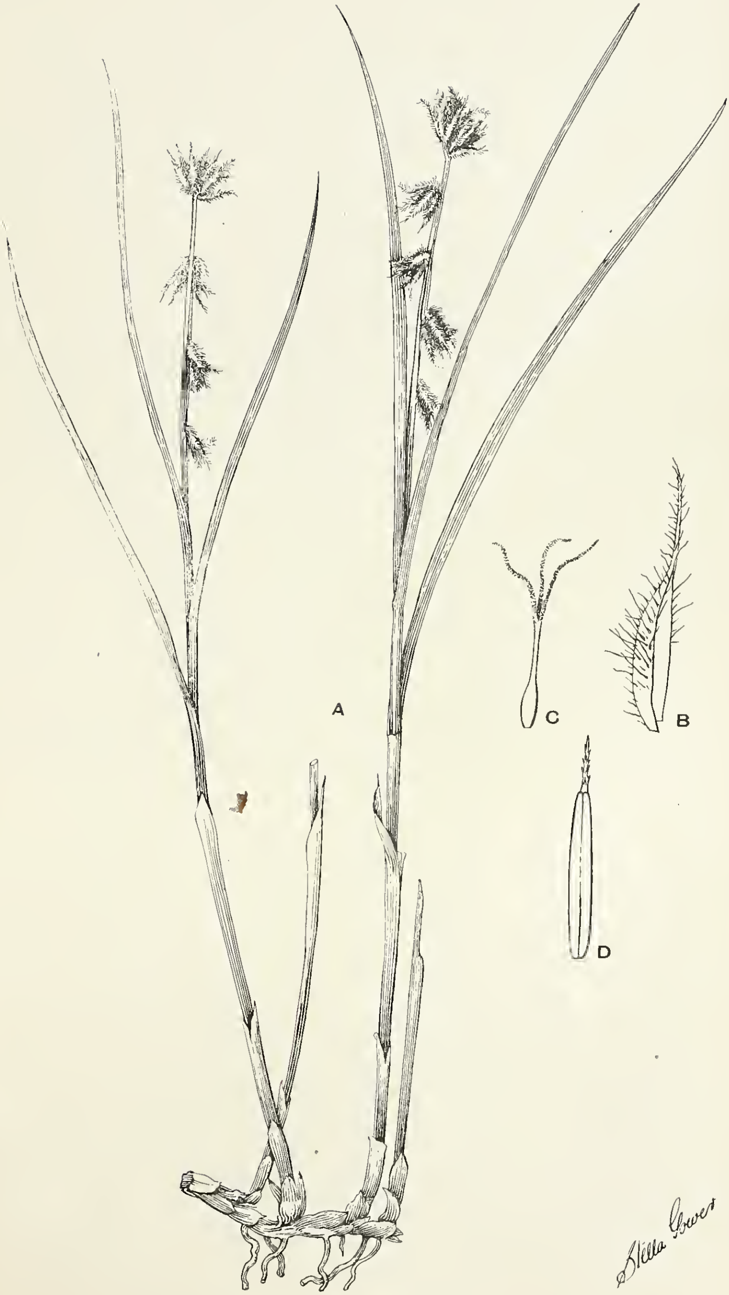
Cladium jamaciense Crantz. (C. Mariscus R. Br.).

Plate LXXII.



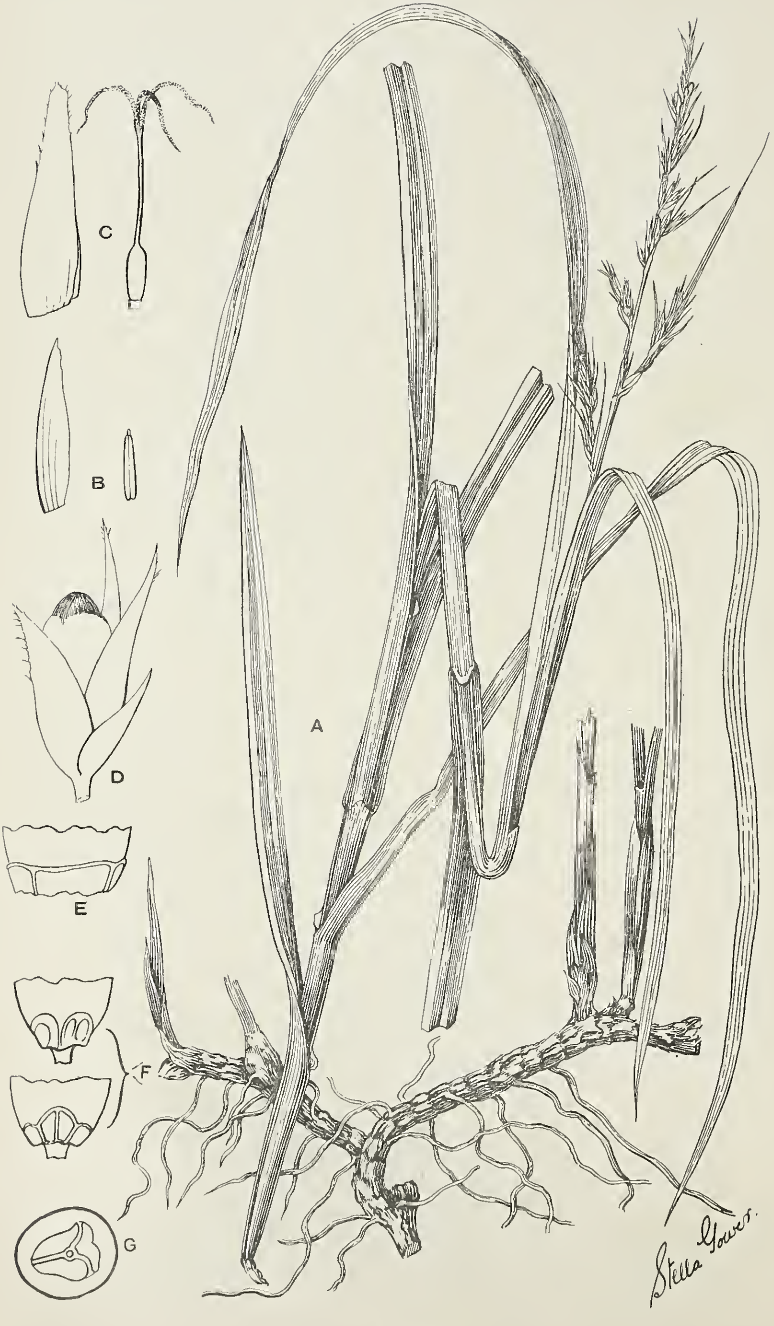
Chrysithrix capensis L.

Plate LXXIII.

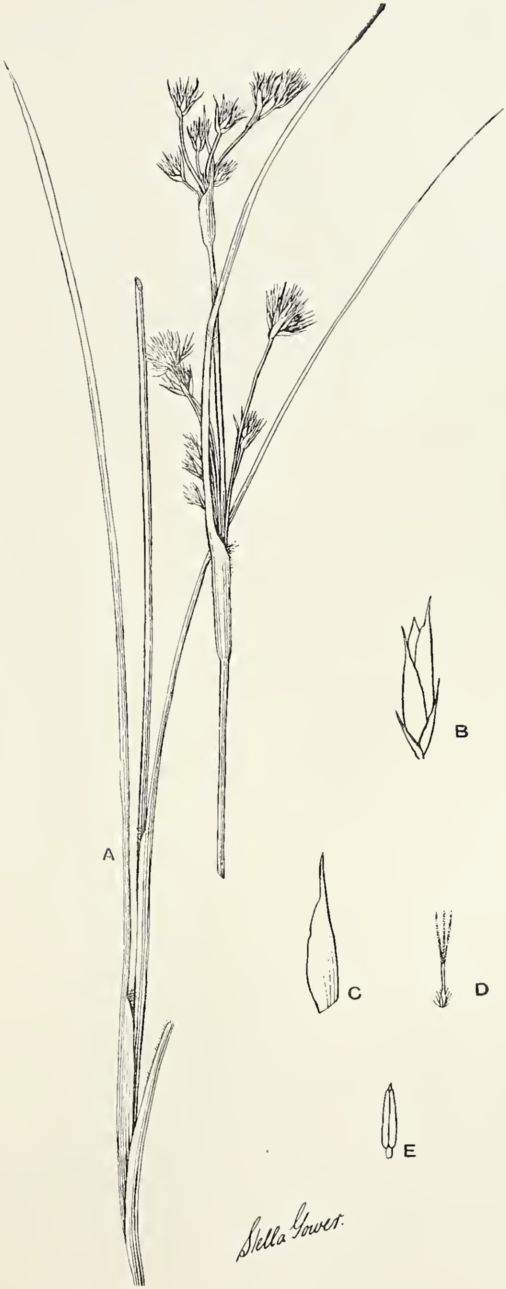


Scleria hirtella Swartz.

Plate LXXIV.

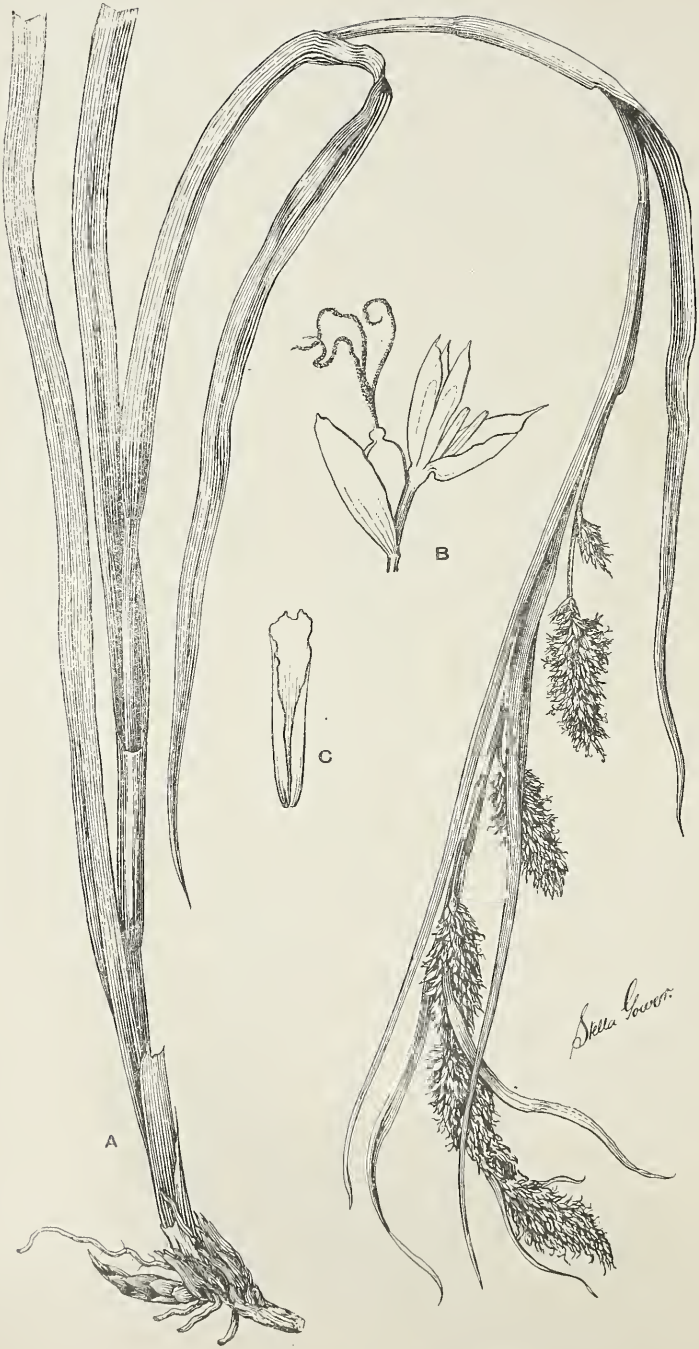


Scleria melanomphala Kth.



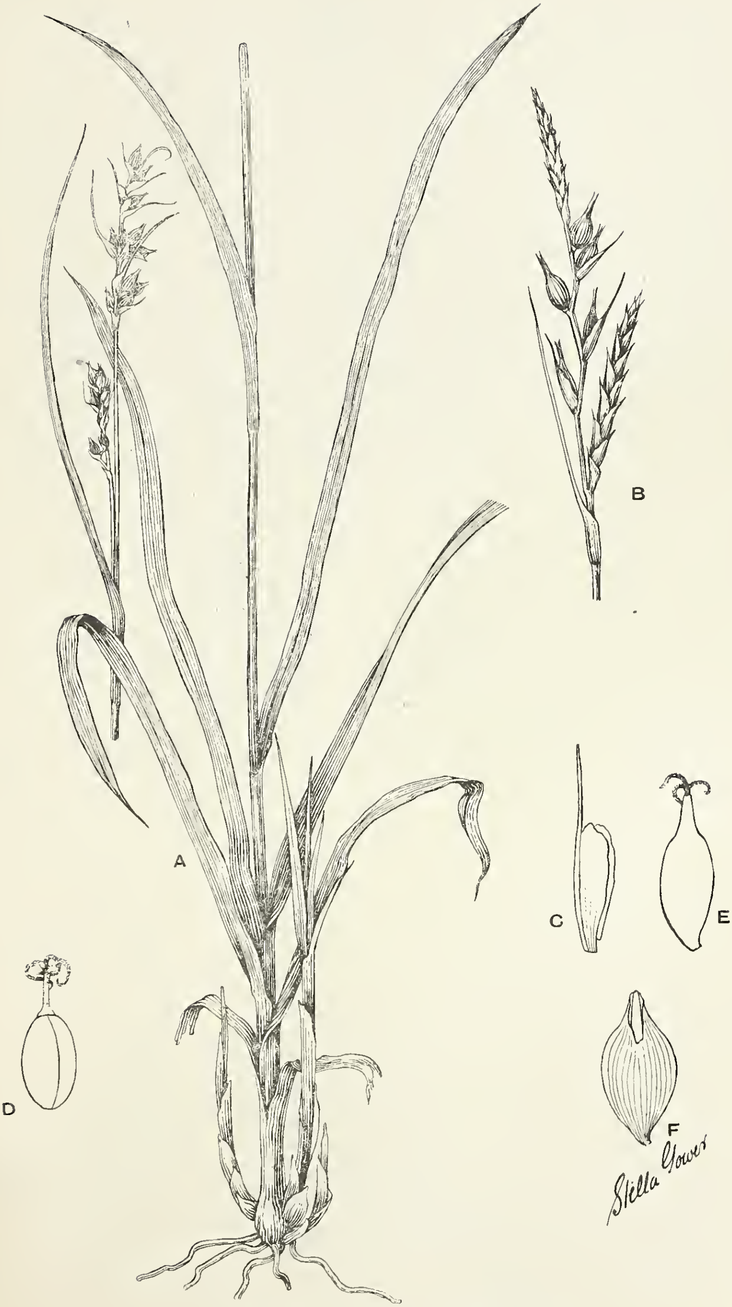
Eriospora rehmanniana C. B. Cl.

Plate LXXVI.



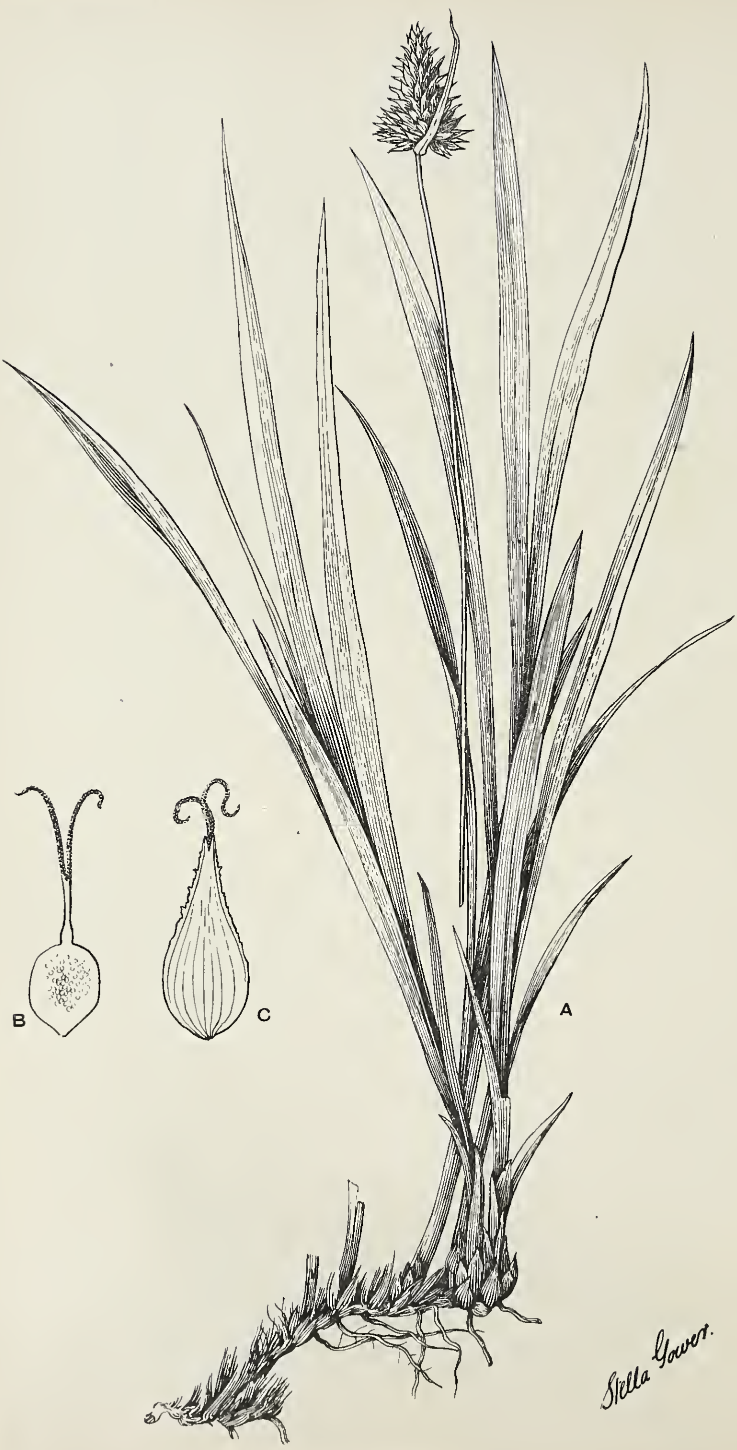
Schoenoxiphium rufum Nees, *β dregeanum* (Kth.) Kük.

Plate LXXVII



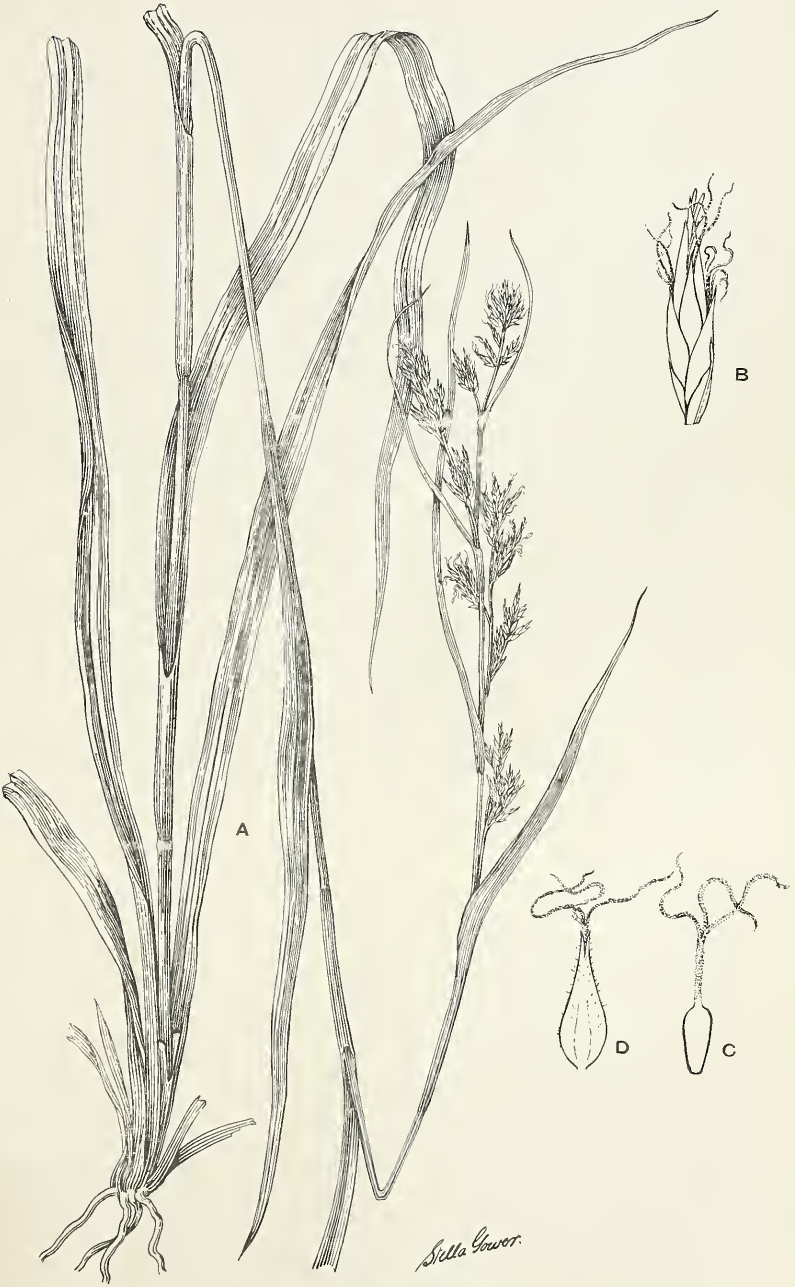
Schoenoxiphium sparteum (Wahlenb.) Kuk.

Plate LXXVIII.



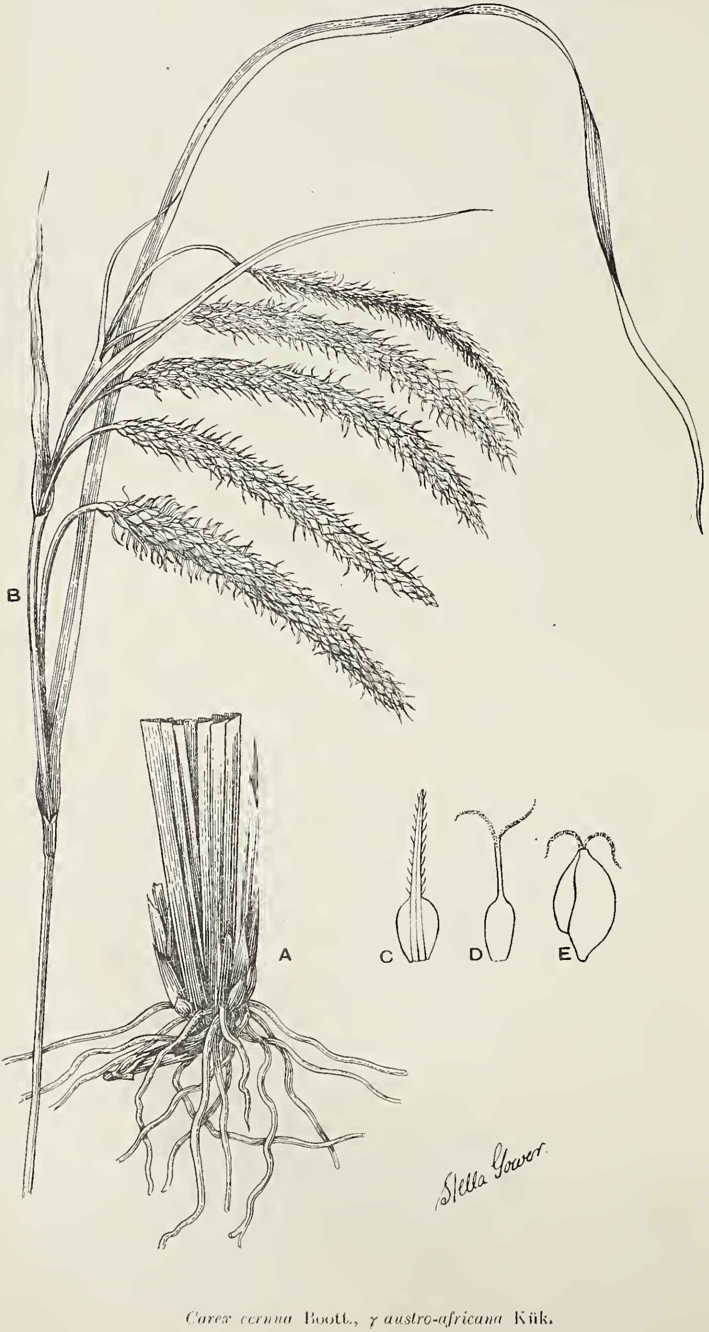
Carex vulpina L.

Plate LXXIX.



Carex zuluensis C. B. Cl

Plate LXXX.



Carex cernua Boott., γ *austro-africana* Kük.

UNION OF SOUTH AFRICA

BOTANICAL SURVEY OF SOUTH AFRICA

MEMOIR No. 4

A GUIDE TO BOTANICAL SURVEY WORK

ISSUED BY THE ADVISORY COMMITTEE FOR THE BOTANICAL SURVEY OF SOUTH AFRICA

To be had from the Department of Agricultural, Union Buildings

PRETORIA
THE GOVERNMENT PRINTING AND STATIONERY OFFICE
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INTRODUCTION.

THE BOTANICAL SURVEY OF SOUTH AFRICA.

The establishment of the Botanical Survey is one of the direct scientific results of the Union of South Africa.

Soon after Union was brought about, all the botanical work that had hitherto been undertaken by the Governments of the four Provinces, viz., the Cape of Good Hope, Natal, the Orange Free State, and the Transvaal, was placed under the care of the Union botanist, who held the post of "Chief, Division of Botany and Plant Pathology," in the Department of Agriculture.

This concentration of work under one official head at once made co-ordination of botanical research throughout the Union possible, and brought the carrying out of a botanical survey, for which official and private workers alike had long felt the need, within the pale of practical politics.

After such a survey had been advocated and urged upon the authorities by the Union botanist, its claims were again put forward by the Scientific and Technical Committee appointed to advise the Government on various matters during the Great War.

The objects of the Survey were also at this time brought directly to the notice of the late General Botha, then Prime Minister, with the result that in July, 1918, the Hon. H. C. van Heerden, Minister of Agriculture, approved of the appointment of an Advisory Committee for the Botanical Survey, and appointed the Chief of the Division of Botany and Plant Pathology, Director of the Survey.

This Committee included the most experienced botanists in the different Provinces, who, though they were not in Government employ, had come forward and had offered their services gratuitously towards any workable scheme which might be projected for the furtherance of a botanical survey of the country.

The Advisory Committee consisted of the following botanists, whose positions were purely honorary:—

Dr. I. B. Pole Evans, Director.
Mrs. Bolus, Curator of the Bolus Herbarium, Capetown.
Dr. Marloth, of Capetown.
Professor Schönland, of Grahamstown.
Professor Bews, of Pietermaritzburg, Natal.
Professor Potts, of Bloemfontein, Orange Free State.
Sir Arnold Theiler and Mr. C. E. Legat, the Director of Veterinary Research and Chief Conservator of Forests, respectively, were also placed on the Committee.

At the first Committee meeting, held in Pretoria, the broad outlines of organization were discussed, and the botanists who formed the Advisory Committee agreed to take charge of the administrative work in their respective areas in connection with the Survey, pending the appointment of whole-time officers. For this purpose the Union was eventually divided into six administrative areas :—

(1) The Cape Peninsula area under Mrs. Bolus.
(2) The Western and South-Western area under Dr. Marloth. The eastern boundary of this area stretches from George to Oudtshoorn, thence through Meirings Poort to Beaufort West, Victoria West, and Preiska.
(3) The South-Eastern area under Professor Schönland. The eastern boundary of this area stretches from Port St. Johns to Maclear, while the northern boundary runs from Maclear along the mountain range to Naauwpoort and Victoria West.
(4) The Eastern area under Professor Bews. It includes Pondoland, Griqualand East, Natal, and Zululand. The southern boundary stretches from Port St. Johns to Maclear, while the escarpment of the Drakensberg forms the western boundary line.
(5) The Central area under Professor Potts. This includes the Orange Free State and Basutoland.
(6) The remaining area, including the Transvaal, Swaziland, Griqualand West, and British Bechuanaland, falls directly under the Director of the Survey.

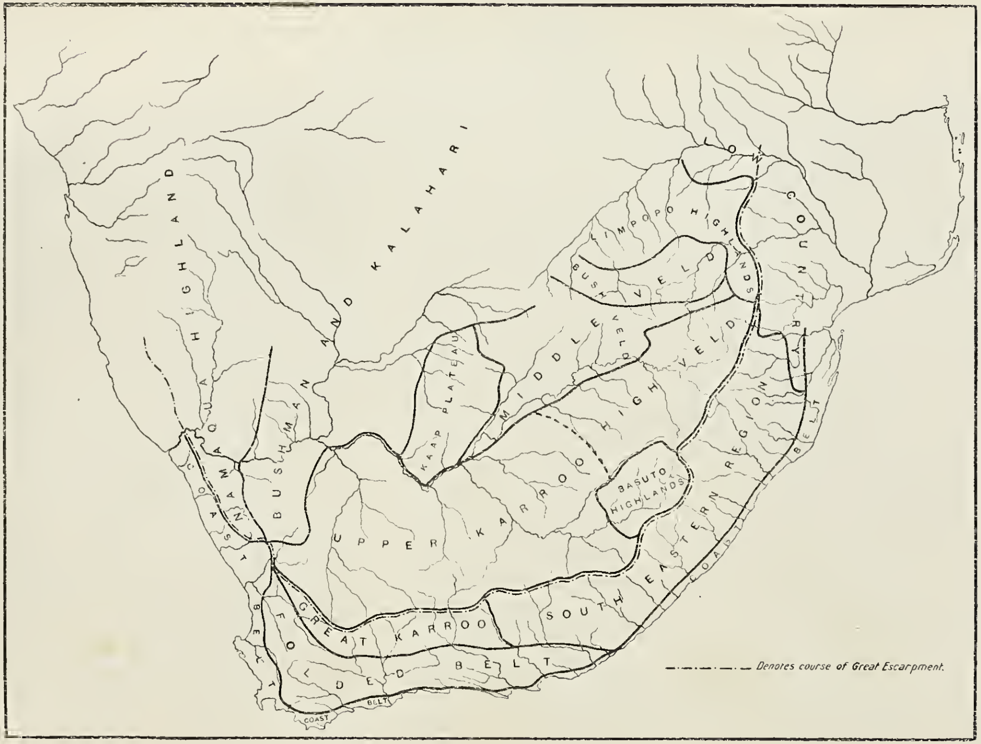
Under this arrangement provision was made for the carrying out of the Survey by voluntary workers, as well as by Government officers. The botanists in charge of the administrative areas were empowered to grant facilities to voluntary workers for travelling and collecting, etc., and were at the same time held responsible for all voluntary workers in their areas, so that co-ordination be obtained and overlapping prevented.

Arrangements were also made for the establishment of regional herbaria in the different administrative areas under the botanist in charge. All the necessary types and records are preserved at Pretoria in the National Herbarium, under the direct supervision of the Director of the Survey.

The chief aims of the survey are :—

(1) To extend our knowledge of the South African vegetation, so that further light may be thrown on its origin and on the past climate of the sub-continent.
(2) To study the vegetation in its relation to agricultural and pastoral development with special reference to veld-burning, overstocking, cultivation, manuring, drainage, and irrigation.
(3) To study the vegetation in particular in its relation to the unsolved stock diseases of South Africa, and thereby extend our knowledge of the poisonous and medicinal plants of the country.
(4) To compare and correlate the vegetation and its associated animal and plant diseases with those existing in other parts of the world under somewhat similar telluric and climatic conditions.
(5) To study and map the South African vegetation-units and investigate the conditions which influence them.
(7) To publish local floras, memoirs, and handbooks dealing with the vegetation from a scientific, economic, industrial, and agricultural standpoint.

I. B. Pole Evans, *Director*.


LOW COUNTRY
LIMPOPO HIGHLANDS
BUSH VELD
MIDDLE VELD
HIGH VELD
KALAHARI
NAMAQUA HIGHLAND
BUSHMAN AND
KAAP PLATEAU
UPPER KARROO
BASUTO HIGHLANDS
SOUTH EASTERN REGION
GREAT KARROO
FOLDED BELT
COAST BELT
COAST
BELT
Denotes course of Great Escarpment.

Botanical Survey of South Africa.

CHAPTER I.

PHYSICAL FEATURES OF SOUTH AFRICA.

By A. W. Rogers, D.Sc., F.R.S.

South Africa is a high-lying country with straight or smoothly curved coasts; over 40 per cent. of the area lies 4000 ft. or more above the sea, though the highest point in it is only some 10,600 ft. The region, as a whole, is therefore an elevated plateau, and that its elevation is comparatively recent geologically is indicated by the high grade of the rivers which drain it. The elevation of the country was not accompanied by any considerable increase in area at the expense of the sea floor; only in Zululand and narrow strips along the coasts is there evidence of post-cretaceous addition to the continental surface. It is probable that the country as far south as the Cape ranges has formed part of a continent ever since Palaeozoic times, and that the area north of latitude 30° has not been under the sea since the remote period when animals and plants possessing structures preservable in sediments began to live. The earliest known marine fossils in this country are those in the Bokkeveld (Devonian) beds, which stretch as far north as latitude 32°, and which formerly extended farther north to an unknown limit. The marine transgression of which the Bokkeveld fauna is the evidence was of short duration, and the only other evidence of marine conditions within the continental area behind the low-lying and narrow coast belt is given by the two fossils *Conularia* (doubtfully classed with the gastropods) and *Eurydesma* (a lamellibranch) found in the Upper Dwyka shales of the South-West Protectorate: beds of the same age in the southern Karroo have been claimed as marine, but as yet there is no clear evidence for it. With this possible exception, the Karroo formation, which is the most extensive group of sediments in the country and is in all over 20,000 ft. thick (though not at any one place), is the sand and mud derived from an area much greater than that of the present South Africa and laid down by rivers in a region comparable with the Indo-Gangetic plain, in so far as both were sinking areas not covered by the sea, but continuously supplied with detritus by streams and wind. The Karroo beds were formed on the hypothetical continent of Gondwanaland (Suess), and their closest analogues are in Brazil, the Argentine, and the Falkland Islands, while perhaps rather less closely related successions of rocks are in the southern continent (King Edward and Victoria Lands), India south of the great ranges, and Australia. The important point about these Gondwanaland rocks for our present purpose is that they were deposited in fresh water or on land, and contain relics of animals and plants which lived on land during the long period from the carboniferous to the jurassic. Our knowledge of these rocks and their fossils is at an elementary stage, but the results won hitherto promise information of the greatest importance for the student of the evolution and distribution of living things.

South Africa is divided into an interior plateau and the more varied country between it and the sea by an escarpment. This great escarpment is very well defined southwards from the Pietersburg district, where it is known as the Drakensberg, and is made of the Black Reef quartzites as far south as the headwaters of the Komati River ; from there southwards it is made of Karroo rocks lying on granite and pre-Transvaal sediments. Higher and higher beds of the Karroo system come in successively to the south and the ancient rocks become hidden under the Karroo beds, until in the Quathlamba or Drakensberg of Natal the highest known beds of the Karroo system form the summit of the escarpment, which is here the highest land in South Africa. Trending at first south-south-west and then south-west from the Tugela basin, the escarpment is made of the highest major subdivision of the Karroo system (Stormberg series) as far as the Stormberg region, where its course turns nearer west, and the upper Karroo rocks disappear from its summit in the Sneeuwberg, Nieuwveld, Komsberg, and Roggeveld. In the Roggeveld region a terrace comes in between the Karroo beds forming the upper part of the escarpment and the Bokkeveld escarpment of Van Rhyns Dorp, a cliff of Table Mountain sandstone resting on Nama beds and facing the coastal plain. The terrace wedges out between Stinkfontein Poort and Langeberg, beyond which the Karroo beds are no longer found at the edge of the escarpment, now made of gneiss alone, the Table Mountain sandstone and Nama beds having successively disappeared from it owing to pre-Karroo denudation and faulting respectively. Gneiss and its included schists form the whole of the escarpment south-east and west of Kamiesberg and as far north as the Buffels River valley, where the base of the Nama system, now lying flat, appears as a thin layer of quartzite at its edge. From Klipfontein northwards to the Orange River the escarpment and country immediately east of it are deeply cut into by stream beds with steep slope to the sea, but in the South-West Protectorate it again becomes a well-defined feature, at least in the southern part of the territory.

The relation of the escarpment to the river systems is definite and important ; from Carolina round by south, west, and north to the place where the Orange River traverses it by a gorge, the escarpment is almost coincident with the watershed between the Orange River and its tributaries, draining the interior plateau on the one hand, and the shorter streams which flow directly to the sea on the other. North of Carolina the escarpment is not an important watershed , the Limpopo traverses it by a low-worn valley, very different from that of the Orange, and the drainage of the central Transvaal passes through it by the gorge of the Olifants River. The Orange River basin has been diminished by captures effected by the Komati and Buffalo Rivers, and in the drier region of Namaqualand similar events are in progress ; the Buffels and Green Rivers have taken the entire drainage of Kamiesberg from the Orange catchment. The escarpment is for the most part formed, or capped, by flat or gently inclined hard rocks, either sediments, intrusive sheets, or lavas, and to these rocks it owes its definiteness, for they have checked the headward development of the streams coursing down the more rapid slope to the sea, and their disposition and joint-systems tend to maintain vertical cliffs at the top of the slope. Whether we look at the escarpment in the Transvaal Drakensberg, the Natal Berg, Stormberg, Nieuwveld, Bokkeveld, or the hills south of Anenous, the cliffs facing the ocean are the striking feature in the view.

The persistence of this escarpment along more than a thousand miles is in conformity with the general steep grade of the rivers draining the country, for both point to geologically recent elevation.

The top of the escarpment is, as a whole, the highest belt in the country, and it is only in the Cape ranges that we find small areas exceeding in height the top of the escarpment inland of them.

The interior plateau and the country outside it can be divided up into several regions more or less sharply by characters dependent on past geological events and climate. The number of these regions can, of course, be increased by narrowing the range of characters considered to be distinctive of each, and the degree to which the process is carried is determined by the purpose in view. The regions chosen for this sketch are as follows :—

The interior plateau—
(1) The High Veld.
(2) The Middle Veld.
(3) The Upper Karroo.
(4) The Basuto Highland.
(5) The Limpopo Highland.
(6) The Bushveld.
(7) The Kalahari and Bushmanland.
(8) The Kaap Plateau.
(9) The Namaqualand Highland.
(10) The Low Country (including much country below the escarpment).

The country below the escarpment—
(11) The Great Karroo.
(12) The South-Eastern Region.
(13) The Folded Belt.
(14) The Coast Belt.

The interior plateau is drained by the two largest rivers in the country, the Orange and the Limpopo, and by the Olifants River. The Limpopo has the more open and gently graded valley of the two ; it has reached a maturer stage in river development than the Orange perhaps owing to its being throughout its course in a region of higher rainfall, and this circumstance may have persisted during the past existence of the two rivers.

The Orange River flows through a region of very low rainfall for some 600 miles above its mouth ; from the Prieska district to the sea it only occasionally receives water from tributaries : in fact, the loss of water by evaporation must exceed the influx below the confluence of the Orange and Vaal Rivers. Beyond the Kenhardt district (Augrabies Falls) the Orange runs through a gorge or very steeply sided valley to within 50 miles of the sea. A discussion of the relative importance of uplift and possible change of climate in past time in determining the characters of the Orange and Limpopo drainage-basins would lead too far for the present occasion, but it should be borne in mind that a desert climate tends to produce flat surfaces over wide areas both by erosion and the filling-up of valleys, and also depressions or pans wanting an outlet for running water ; while a climate wet enough to maintain river channels leading eventually to the sea or to an inland depression of tectonic origin (i.e. due to movements of the earth's crust) produces continuous slopes which tend to become plains advancing inland as long as the country remains stationary relatively to sea-level and is not tilted. If the country rises as a whole, the downward cutting of the rivers is increased, the renewed activity starting from the coast and proceeding upstream ; if the country is tilted, the effects vary according to the situation of each tract or stream relatively to the tilt.

There is a contrast between those parts of the interior plateau which are still covered by Karroo rocks and those from which the Karroo formation has been denuded ; plains and flat-topped and terraced hills are characteristic of the former, while plains and ridges, often of the "inselberg" type, are found in the latter. The Karroo beds extended over the whole of the plateau at no very distant date, and the hills made of pre-Karroo rocks we see to-day, such as the Magaliesberg, Witwatersrand, and the Langeberg of Bechuanaland, owe their shape in the main to pre-Karroo denudation, and their old forms have been revealed through the removal of the Karroo rocks under which they were formerly buried. The plateau reaches its greatest elevation in the Basutoland mountains, where it is so dissected by the headwaters of the Orange River that the plateau character is concealed. The structure of Basutoland, however, unites it with the rest of the plateau.

An important point concerning past climatic conditions may be touched upon here: the extent to which South Africa was affected by the fall in temperature which brought about the lowering of the snow line in Europe, America, Central Africa, Asia, Australia, and New Zealand. South Africa can hardly have escaped the influence of these worldwide conditions, but up to the present time no indisputable sign of the former existence of glaciers in the country since the period of the Karroo (Dwyka) ice-sheets has been found. The few supposed moraines and glaciated surfaces yet reported have not met with acceptance, and the characters of the high-lying valleys in the Basuto mountains and the Cape ranges point to stream and not glacial erosion as having had at least the chief share in their production.

Inselberge are hills which rise abruptly from a plain, such as the kopjes of metamorphosed Pretoria beds in M'Pathlele's Location and the Korannabergen of Bechuanaland.

(1) *The High Veld* covers the south-eastern Transvaal and much of the Orange Free State; the surface is directly underlain by the Karroo beds lying flat or by dolerite sheets intrusive in them. It is characteristically a grass veld, and the soil is on the whole deeper than that on the older rocks to the west. The rivers have cut rather deep valleys with gently inclined sides in the country near the escarpment, but undulating and flat surfaces predominate towards the east. The rainfall is moderately high (20 to 35 in.), and the rivers usually have water in them. A noteworthy contrast between the High Veld and the Middle Veld is due to the lack of superficial deposits of limestone in the former and their abundance in the latter, whence they continue over the Kaap Plateau and the Great Karroo. This difference does not indicate poverty in lime of the rocks in the east, but it is intimately connected with the westerly decrease in rainfall. In a dry climate much of the carbonate of lime dissolved by percolating rain-water is left in the soil by the evaporation of the solvent, but in a wetter climate most of it is carried to the streams in weak solution. The High Veld, in common with the country to the west, has an abundance of pans, flat surfaces below the level of the immediately surrounding country without a valley leading from them. The pans of the north-eastern part of the High Veld, of which Lake Chrissie is a very fine example, are remarkably large and deep, and their origin is a most interesting problem. The wind is an efficient agent in the formation of pans in a dry region, and pans are characteristic of dry countries throughout the world, especially where the country happens to be made of horizontal beds; but the eastern Transvaal has a good rainfall, and it is difficult to understand how the rainfall there was ever less than in the western Transvaal and the country still farther west. The Lake Chrissie group of pans has reached a further stage of development than those of the rest of the plateau, except perhaps a few of the pans in the Kalahari. The existence of the pans is itself evidence of a former climate drier than

the present, but there is as yet no corroborative evidence known, either in the existence of patches of superficial limestone or remains of inselberge. Possibly there may be some feature in the vegetation which throws light on the question.

(2) *The Middle Veld*, a term borrowed from its local use for the country between the High Veld and the Bushveld and Bechuanaland, includes the districts of Potchefstroom, Bloemhof, Wolmaransstad, Lichtenburg, and Taungs, and parts of Pretoria, Middelburg, Heidelberg, Rustenburg, Marico, Vredefort, and Barkly West. It is made up of pre-Karroo rocks with only small outlying areas of Karroo beds lying on them, and in it are the extensive high- and low-level gravels of the Vaal and Harts Rivers, which are the seat of the river diggings. Volcanic rocks of the Ventersdorp system occupy wide flat areas in the south-west between Klerksdorp, Ventersdorp, Vryburg, and Barkly West, with the Witwatersrand beds and older granites and schists appearing from below them in the Transvaal and Orange Free State portion of the region. The Pretoria series forms important ranges, such as the Magaliesberg and Gats Rand, and the dolomite below that series underlies the surface over large parts of Pretoria, Rustenburg, Marico, and Lichtenburg. The dolomite is the chief water-bearing rock in the Union, but the rock itself is impervious, and it is the widened joints due to solution by ground-water that furnish storage room for it and strongly influence the behaviour of underground water in the areas made of the rock, besides accounting for the apparently erratic disappearance of streams and the occurrence of strong springs. The rivers are less constantly supplied with water in this region than in the High Veld. On account of the varied character of the rocks, such as the quartzites of the Witwatersrand system, the Black Reef and Pretoria series, the shales of the Pretoria series, the dolomite, the Ventersdorp volcanic rocks, and the old granites and schists, the region has a great range of soils, and the vegetation may be expected to show much diversity ; as a whole the region is grass veld and small bush.

(3) *The Upper Karroo* includes the south-west of the Orange Free State, the valley of the Vaal River south of Barkly West, and that part of the Cape Province between the great escarpment on the south, and Bushmanland and the Orange River on the north. Most of the country is made of the nearly horizontal sandstones and shales of the Karroo formation penetrated by sheets and dykes of dolerite, and the drier north-western part of the region has much tufaceous limestone in or below the soil. In Prieska and Kenhardt the rocks of the Transvaal and older systems have to a large extent been stripped of the Karroo beds, and the sediments form low ranges of hills, the Doornbergen and the long quartzite range on the boundary of the two districts, while the granite and gneiss give rise to gently undulating ground with occasional kopjes often appearing to be made up of huge boulders. Where the Karroo beds above the Dwyka series form the country, the hills are markedly terraced by the resistant sandstones and dolerite sheets, one or other of which often makes kranzes on the slopes. The dolerite sheets may be scores or even a few hundred feet thick, and where these happen to form the surface at a moderate height above the river channels cut in or through them, they make exceedingly rough ground studded over with low kopjes between which large and small boulders of dolerite are strewn. Dolerite sheets in the wide flats of Hopetown, Prieska, Britstown, De Aar, and Carnarvon make no prominent features, and they are deeply decomposed and usually accompanied by limestone derived from their decomposition. The position as regards ground-water is the condition governing the behaviour of the dolerite : where the rock is

exposed for long periods to the action of water it becomes decomposed to irregular depths along joints, and where this partly decomposed rock is subjected to active denudation the soft, weathered portions are removed faster than the hard, fresh parts ; the sheets capping hills high above the general level of the neighbourhood maintain a fairly even surface and are little decomposed. The dykes, which are numerous, give rise to linear groups of kopjes or ridges, such as are conspicuous features in the landscape between Beaufort West and De Aar. The inclined dykes or sheets are more apt to produce these features than the vertical dykes. The larger groups of hills between the flat country of the north-west and the edge of the escarpment are not linear ranges, but irregular remnants of plateaux. The rivers have low grades after leaving the hilly country, and wide stretches in the lower part of the valleys are covered with water in flood times. These flats are in the shales and tillite at the base of the Karroo formation, rocks which are easily removed by the action of the wind and rain, while farther down, the rivers traverse the hard archaean rocks which form the floor of the Karroo beds north of latitude 31½°, check the downward cutting of the river-beds, and allow the rain and wind to cut great flats on the more easily denuded Karroo formation to a level very little above that of the outcrop of the archaean border. The extensive " vloers " of Calvinia and Carnarvon, which are found near the edge of the Karroo outcrop, are such flat surfaces thinly covered with the finest silt dropped from flood-water, and, in some instances at least, the silt is impregnated with soluble salts. The striking absence of vegetation from the vloers is no doubt chiefly due to the abundance of the salts, but in part it may be due to difficulty seeds have in establishing themselves on the almost continuous film of hard, dry mud.

(4) *The Basuto Highlands* are distinguished from the High Veld and Upper Karroo by their mountainous character. The mountains consist of those parts of the highest series of the Karroo formation, the cave sandstone and the volcanic beds, which have not been removed by denudation. Basutoland is the highest lying of the regions, for narrow strips along the Caledon and Orange Rivers alone lie below 5000 ft., and the mountains attain heights exceeding 10,000 ft. The whole region is carved out of the uppermost sub-division of the Karroo system, the Stormberg series, of which the pale-coloured cave sandstone and the overlying dark basaltic lavas form the mountain masses. These two groups of beds form the Springbok Flats of the Transvaal, where the rocks are rarely seen cropping out from below the general cover of sand. The great contrast between the surface features of these two areas made of the same rocks is primarily due to their different altitudes above the outlets of the rivers draining them ; in Basutoland the rivers are engaged actively in cutting down their beds, which for some 300 miles are made of Karroo rocks only, while the Nyl and Olifants Rivers, which drain the Springblok Falts, meet the hard belts of the Limpopo Highlands within a short distance of the flats, where the rocks have disintegrated faster than the streams can carry away the sand, owing to the great resistance of the hard rocks to the corrosion of the rivers.

(5) *The Limpopo Highlands* comprise the rugged country of the northern Drakensberg traversed by the Steelpoort and Olifants Rivers, the Waterberg and Pietersburg plateaux, and the Zoutpansberg. The greyish quartzites of the Black Reef series in the south-east give rise to rough hills with scanty and sandy soil, while the granites of the Pietersburg plateau with their included schists form more undulating and bush-covered country. The contrast between the forest belt on Zoutpansberg and the Woodbush on

the eastern slope of the region on the one hand, and the thorn-bush country north-west of Pietersburg on the other, is very great: it depends on the great difference in rainfall between them. The northern Drakensberg is made of the Black Reef series, here a group of quartzites some 2500 ft. thick, including quite subordinate shales; the same series near Pretoria and Johannesburg is a few feet thick only, and one may at places pass over it without noticing its outcrop. Where the rivers from the Pietersburg plateau traverse the range on their way to join the Olifants River in the northern Bushveld they have cut deep gorges, such as Chuniespoort, and even greater gorges have been cut by the Olifants, Ohrigstad, and Blyde Rivers draining the Bushveld and the country between it and the escarpment through the Black Reef series on their way to the Low Country. The scenery along these rivers is amongst the grandest in the Union. The southern part of the Highlands is separated from the Bushveld by the valleys of the Blyde, Ohrigstad, Spekboom, and other rivers, cut for the most part along the strike of the Dolomite and Pretoria series.

(6) *The Bushveld* is the flat and undulating country in the central Transvaal surrounded by long ridges of Pretoria beds, which are inclined towards it. The greater part of the area is directly underlain by the igneous rocks of what is called the Bushveld complex, a great bun-shaped mass of rocks varying from granites to pyroxenites, but closely connected in origin, which in pre-Karroo times made their way approximately between the Transvaal formation and the unconformably overlying Waterberg rocks. This enormous mass of igneous rocks, some 280 miles long and 160 miles wide, is the dominating feature in the structure of the Transvaal, and the trend of the encircling ranges of the Magaliesberg and the hills of the western and eastern Transvaal (within the escarpment) is clearly connected with its intrusion; dykes and sheets belonging to the complex reach the southern and western Transvaal. Large areas of the Karroo formation still remain within the region; the Springbok Flats is the largest of these. The Bushveld lies between 3300 ft. and 4000 ft. above the sea, and it has predominantly sandy soils, with large areas of black "turf," swampy ground containing much organic matter, which owes its existence to the want of drainage. The northern part of the area within the angle formed by the Drakensberg appears to have a very low rainfall, and it is in this dry country that island-mountains are well developed, as in M'Pathlele's Location. The rainfall in the Bushveld generally is rather low, but the sandy soil no doubt conserves the water. The bush roots go deep for their water; the writer saw strong roots in the joints in pyroxenite at a depth of 75 ft. in a prospecting hole west of Pilandsberg. To the south a transition to the High Veld is found in the country called Banken, formed by the outcrops of successively lower beds of the Transvaal system; eastwards similar country leads to the escarpment and the south end of the Limpopo Highlands, while to the west the same kind of country in Rustenburg and Marico separates the Bushveld from the Kalahari. The Bushveld contains two extremely interesting relics of volcanic activity of very different age and character; one is the most remarkable circular group of hills, Pilandsberg, rising abruptly like an inselberg from the plains of Rustenburg; and the other is the salt pan some twenty-eight miles north of Pretoria. Pilandsberg is the remains, now eighteen miles wide, of a considerable pile of lavas, tuffs, and intrusive rocks related in character to the lavas; they are of uncertain age, though they are probably post-Waterberg and pre-Karroo. The salt pan is surrounded by a closed ring of granite hills about half a mile wide, rising 60 ft. and more above the neighbouring Bushveld, and the pan

lies about 150 ft. below the level of the Bushveld. The mud of the pan floor contains chloride and carbonate of soda, and the place marks the site of a volcanic explosion unaccompanied by the extrusion of lava, and of comparatively late date.

(7) *The Kalahari and Bushmanland* are separated by the deep rocky valley of the Orange River, but they are alike in having a low rainfall and practically no water at the surface, and in being thickly covered by sand through which rise steep hills of the island-mountain type, especially near the Orange River valley in this region, but to the north and south of that valley the Karroo rocks take an increasingly greater part in the structure of the country as the distance from the river increases. In Bushmanland the valley south of Henkries, from which the Karroo beds had already been removed, became partially filled in with wash from the surrounding country at a time (perhaps late cretaceous) when dinosaurs lived there, and has never since been competely re-excavated. Up to the present the evidence comes from one well, but there is reason to believe that similar facts await discovery in other parts of the region. The importance of the find is that it proves north-west Bushmanland to have been a land surface when dinosaurs lived there, and it shows that the region was one of low rainfall then and has remained without material change in either direction until the present time. Had the rainfall at any period been much greater than now, the valley would have been swept clean of the late cretaceous wash by rain, and had it ever been much less the wind would have produced the same result. Flat surfaces are characteristic of the Kalahari–Bushmanland region, and both in north-western Bushmanland and the southern Kalahari, plains have been formed by the filling up of valleys as well as by the cutting flat of the surface of hard rock by wind and rain ; in those parts more distant from the Orange River the plains may be chiefly due to the erosion of flat surfaces in the horizontal Karroo beds. The southern Kalahari is traversed by the Hygap, a river formed by the confluence of the Nosob, Molopo, and Kuruman Rivers ; the Hygap is usually dry, and receives water only from the country south of Abiquas Puts, but the last time the Kuruman brought down much water (in 1894) the water was diverted over a wide pan on the right bank by the sand which had dammed the main channel. The three tributaries of the Hygap come from regions of greater rainfall than the southern Kalahari, and the absence of minor tributary valleys in the latter region is evidence of the very long duration of approximately the existing conditions as regards rainfall. The southern Kalahari and Bushmanland are by no means deserts ; they support a good growth of grass, and in places bush, and the valleys in the former are marked by a thick growth of camel-thorn trees. One often hears that the numerous dead trees seen in the Kuruman and Molopo valleys indicate a recent decrease in rainfall, but it is likely that the ravages of caterpillars, which were very obvious in 1907 and 1916, have had a very important share in producing the damage even if they are not wholly responsible. The rainfall in these regions is mostly absorbed by the sand ; there is practically no run-off, and the evaporation is probably low on account of the rapid absorption by the sand. The rainfall is insufficient to form a water-table below which water will collect in wells, but it gives rise to a damp belt of sand, which probably varies in thickness according to the season and other conditions ; it is this damp sand which supports the vegetation. The average depth of sand is not known ; wells on Pepani, south of Morokwen and on the border between the Kalahari and the Kaap Plateau, prove 130 ft. of sand lying on granite. In the Henkries valley

in Bushmanland sand was penetrated to a depth of 430 ft. The sand is red except where it has been subject to the reduction and removal of ferric iron, which takes place where the sand remains wet for some days or weeks together at intervals ; thus the sand in river valleys and pans is white or grey. Dunes are developed along the valleys, on the lee side of pans, and in the peculiar group of sandhills called Witsands in the south-east of the southern Kalahari. In the Kalahari and Bushmanland generally the definite and persistent ridges of sand are grassed over : these immovable dunes are probably relics from a period when the rainfall was less than at present. Much of the area is occupied by wide sand-bults without dunes on them. Along the Orange River, where the cattle have to make long journeys between the grazing ground and the water, the area of bare shifting sand is increasing owing to the constant trampling of certain strips of veld.

(8) *The Kaap Plateau* lies between the Kalahari on the west and the Campbell Rand, an escarpment of pre-Karroo age, on the east. The Campbell Rand overlooks a valley (Dry Harts-Vaal) from which the Karroo rocks formerly filling it have not yet been completely removed. Though the Kaap Plateau would be a more self-contained unit if the term were restricted to the limestone plain east of the Asbestos hills, it is customary to include that range and the country as far west as the Langeberg in the plateau, which thus ranges from about 4000 ft. in height along the edge of the rand to rather over 6000 ft. in the highest points on the Asbestos hills and the Langeberg. The dolomite and limestone plateau east of the Asbestos hills is remarkably flat, and it is some 80 miles wide between Taungs and Kuruman, becoming narrower to the north and south ; it has a peculiar interest in being part of a much more extensive plain possibly formed in late cretaceous times and still retaining at places the remains of gravels belonging to the period of its formation. The easy underground drainage afforded by fissures dissolved along joints in the limestones is no doubt the cause of the preservation of the plateau through so long a period, but the age of the gravels has not been proved by the discovery of fossil remains. A similar but smaller limestone plain lies between the Asbestos hills and the Langeberg. The Asbestos hills are traceable from the Doornberg in Prieska northwards almost to the Molopo, while the Langeberg disappears under the sand farther south. These ranges have smooth outlines, but they are rough country to walk over. The Langeberg is made of quartzites of the Matsap (Waterberg) group, and the Asbestos hills consist of the ferruginous jaspery rocks of the Griquatown (Pretoria) beds ; both give rise to rather poor soil, but the country between the ranges is fertile but dry, and the soil becomes increasingly sandy to the west as it merges into the sand of the Kalahari.

(9) *The Namaqua Highlands* form the north-western edge of the interior plateau. As the surface of Bushmanland rises westwards it becomes divested of its sand and deeply cut into by the headstreams of the Green and Buffels Rivers and the tributaries of the Orange. This rocky country is made of gneiss in the south, but towards the north an important part in its structure is taken by the Nama formation, and in the valley of the Orange River there are down-faulted outliers of the Karroo beds. The presence of important faults of post-Karroo age in the interior plateau is quite exceptional ; the only other instances known are in the neighbourhood of the Karas mountains, which are part of the northern extension of the Namaqua Highlands, and in the Limpopo valley. The Namaqua Highlands reach the height of 5510 ft. in Kamiesberg, and the rainfall is there sufficient to supply short perennial streams, but northwards the

climate becomes drier, and the Richtersveld, the mountainous country south of the Orange River, and partly enclosed by the great bend of that river near its mouth, is very dry. An interesting though small part of the region is Neint Nababeep, a plateau of limestone stretching 17 miles southwards from the Orange River near Viools Drift. Another wide band of limestone (probably of the same age) on the west flank of the Richtersveld lies for the most part in the coast belt. The Namaqua Highlands receive most of their rain during the winter months, and there is a sharply marked limit between this region of winter rains and the region of summer rains to the east.

(10) *The Low Country* includes part of the Limpopo valley behind the escarpment, which is here very much lower than to the south owing to the widening of the valley, and the country between the escarpment and the Lebombo range. On account of the open character of the Limpopo valley, which is thus strongly contrasted with the gorge of the Orange River where it traverses the Namaqua Highlands, the Low Country includes areas both within the interior plateau and outside it; this difference between the two valleys is probably due to the wet climate in the east having effected greater denudation there than that produced by the arid climate in the west. Granites, gneiss, and sedimentary and volcanic rocks of the Swaziland system make up most of the sub-region, but the Karroo formation covers large areas in the Limpopo valley, and the Lebombo range is formed by a thick group of these rocks apparently bent over and severed by denudation from the Karroo beds of the High Veld with which they were once continuous. The country ranges in altitudes from some 500 ft. to 3000 ft. above the sea, and the rainfall varies from 50–70 in. in places on its western limit to 15–25 in. in the eastern part and the Limpopo valley. Thus the richly supplied streams leaving the escarpment quickly dwindle in volume, and while forest and dense vegetation flourish in the districts with heavy rainfall and along the larger rivers, the open country is covered with bush. On the escarpment south of the Woodbush there is a most striking example of alteration of the drainage system by the action of streams without the intervention of earth-movements; the Groot Letaba, fed by the heavy rainfall of the escarpment and having a shorter course to the Limpopo, has captured a river which formerly ran south through the Strypoort range, now represented by the upper part of the Letaba and the Mathlapitsi, the deep gorge of which commences only a few hundred yards from the present source and from the nearest point on the Letaba. The Low Country slopes from the escarpment in broad undulations, which become less and less marked as the distance from the escarpment increases; the prominent hills far from the escarpment are for the most part island-mountains made of hard schist and massive granite.

The country below the escarpment is much less in area than the interior plateau, but it presents equally varied conditions as regards climate and considerable diversity in structure. The dominating feature in its structure is the belt of mountain ranges due to the resistance to denudation offered by the harder rocks involved in the folding of the rocks south and west of the present Karroo in late Karroo times; these mountains are conveniently called the Cape ranges. They form a curve which does not follow the bend of the escarpment closely; the north-north-west components (Cederberg, etc.) meet the east-west ranges (Langebergen, Zwartbergen) in the Ceres district at a much sharper angle than the bend of the escarpment north-east of the Tanqua Karroo, and the east-west ranges run out to sea in the Peddie district instead of turning north-east in conformity with the course of the escarpment. The country can be divided into the following regions :—

(11) *The Great Karroo* is the dry region between the escarpment and the Cape ranges ; its eastern limit may be taken to be the valley of the Sunday River, but its distinction from the south-eastern region depends entirely on the gradual increase of rainfall towards the east. The region ranges from about 1000 ft. above sea-level in the valleys of the Gamka and Dwyka Rivers immediately behind the mountains to over 4000 ft. in the Klein Roggeveld. The driest parts are the Tanqua Karroo in the west and the Ghoup (or Gouph) which covers the valleys of the Gamka and Dwyka. The Buffels valley, or Mordenaar's Karroo, between the Dwyka and the Klein Roggeveld is almost as dry. Thin soils and rock-strewn surfaces between the outcrops of shales and sandstones are characteristic of the region, and dolerite intrusions appear at the surface only near the northern limit. The whole area is formed by the lower half of the Karroo formation, excepting the prominent and sharp arch of Witteberg quartzites in Tygerberg near Prince Albert. There are no pans in the region. Vegetation is scanty; small drought-resisting bush is conspicuous, while grass and annuals are only seen at long intervals ; the dry river-beds are often lined by low trees, chiefly thorns. This is the region where perhaps the most marked decrease in surface-water is noticeable when the present conditions are compared with those described by the travellers of a century or more ago, and the decrease is clearly due to the destruction of reed-beds in the rivers, overstocking, and the facilities for the rapid run-off of rain-water afforded by sheep tracks. In the south the surface forms have in general a linear arrangement owing to the outcrop of steeply inclined beds of alternately hard and soft rocks near the Cape ranges, but towards the north the rocks dip at low angles and the country is a dissected plateau with terraces marking the outcrops of the harder sandstones. Along the mountains in the south there are remains of a gravel-covered plain high above the beds of the existing rivers, which leave the region by way of deep poorts in the Cape ranges.

(12) *The South-Eastern Region* consists of the seaward slope of the great escarpment from the Graaff-Reinet district north-eastward to the southern limit of the Low Country in the Barberton district and Swaziland. On the west, the worn end of the Folded Belt intervenes between the region and the coast, but elsewhere the Coast Belt alone separates it from the ocean. Only north of the Tugela do the pre-Karroo rocks take a large share in the formation of the region ; south of that area terraces, due to the nearly horizontal resistant sandstones of the Karroo beds below the Cave sandstone and the great dolerite sheets intrusive in them, are the most striking features in the landscape. Occasionally the great masses of intrusive rocks belonging to the same group as the Karroo dolerites, but with a greater range in composition, form mountains below the escarpment such as the Insizwa and Ingeli in Griqualand East. The rainfall is low in the south-west of the region and increases towards the north-east, so perennial streams become more frequent in that direction. The rivers in general have steep grades, and the grade is often broken by a fall where a river passes over the outcrop of thick sandstones and dolerites, the valleys are usually deeply sunk in the terraced landscape. Patches of forest and bush are frequent in the protected valleys and on the steep slopes of those parts of the region where rain is abundant, but the characteristic veld is grass.

(13) *The Folded Belt* includes the mountainous country in the south of the Cape Province between the Great Karroo and the coast. Its character

is primarily due to the folding of the Cape and Karroo formation which took place at some period after the deposition of the Beaufort series and produced the great anticlines with more or less complicated structure, the remains of which are seen to-day in the Cederbergen, Langebergen, Zwartbergen, and many minor ranges. The mountains owe their existence as much to the resistant character of the rocks (chiefly the quartzites of the Table Mountain and Witteberg series) as to the folding, for they are on the whole the hardest parts of the great thickness of strata involved in the folds and lying above the lowest level affected by denudation since the crumpling took place. On the north the folds die out in the Great Karroo; on the west and south the intensely folded rocks are bordered by gently inclined beds of the same age or by older rocks exposed by the removal of the Cape formation; and on the east the coast passes slantingwise across the axes of the folds. The region ranges from near sea-level to 7627 ft. in the Seven Weeks Poort peak on the Zwartberg, and it presents perhaps greater variety in soil and climate than any other of the regions into which the country is sub-divided for the purpose of this article: for instance, the Little Karroo of Ladismith (Cape Province) is made of shales and argillaceous sandstones and has a very low rainfall, thus closely resembling parts of the Great Karroo, but it lies within twelve miles of the Tradouw Berg (part of the Langebergen), with wet climate, sour soils, and the stretch of forest called Groot Vader's Bosch on its southern flank. The valleys lie for the most part on the shales and sandstones of the Bokkeveld beds, but the argillaceous shales and sandy conglomerates of the Uitenhage series form large areas in Oudtshoorn, Willowmore, Uitenhage, Riversdale, and Swellendam, while remnants of old plains, covered by sand and gravels cemented by silica into hard rocks and corresponding to the terrace referred to in the description of the southern margin of the Great Karroo, are widespread and modify greatly the characters of the soil proper to the bed rock of the neighbourhood. The Uitenhage beds are not met with west of Worcester, and the old plain high above the present rivers is also confined to the country east of that district, so the character of the country in the west is less varied, but the pre-Cape rocks, Malmesbury beds and granite, underlie the valleys instead of the Bokkeveld and Uitenhage beds. The Warm Bokkeveld lies in the bend of the mountains near Ceres; it is a comparatively low and flat area cut in the rather soft Bokkeveld beds by the Breede River and its tributaries in consequence of their having to make their way through the slowly yielding Table Mountain sandstones. The Warm Bokkeveld is contrasted with the Cold Bokkeveld, the strip of country on the east flank of the Schurfte Berg and Cedarberg, for the Cold Bokkeveld is made of the same rocks as the Warm Bokkeveld, but lies some 800 or 1000 ft. higher and has a colder and wetter climate. * Where the rivers from the Karroo or from within the Folded Belt traverse mountains there is generally a larger or smaller plain cut in the softer rocks immediately north of the mountains; the Warm Bokkeveld is perhaps the best instance, but in the Hex River valley there is another almost equally developed plain, and others are found in the valleys of the Buffels, Dwyka, Gamka, Salt, and Sunday Rivers. Both in the west and south the valleys cut by the rivers along the strike of the rocks are very marked features: they may be wide valleys like those of the Olifants River in the west or of the Touw and Long Kloof in the south, or they may be narrow and often gorge-like, as Boschluis Kloof and Baviaans Kloof in the south. Usually the wider parts of the valleys coincide with

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* The Warm and Cold Bokkevelds must not be confused with the Bokkeveld, a part of the great escarpment in Van Ryn's Dorp, which has been mentioned on previous pages.

the distribution of the softer rocks, such as the Bokkeveld and Uitenhage series, but this is not necessarily the case. The structure of such valleys as Baviaans Kloof and the Breede River below Mitchell's Pass is complicated, but most of the valleys mark the position of synclines or the outcrop of a group of rocks softer than those lying above and below. Limestones are rarely met with in the Folded Belt; the Cango district and smaller areas near Robertson, Piquetberg, and near the coast in Humansdorp alone have thick beds of crystalline limestone. The higher ranges of mountains have jagged outlines for the most part, but where they do not exceed some 4000 ft. in height they have even surfaces as seen from a distance, even where made of steeply inclined alternating hard and soft beds, as in the Zuurberg. These smooth hills are parts of an old surface shaped by denudation at a lower level and left outstanding as the more resistant portions, while the softer rocks were more rapidly removed by the increased erosion consequent on the uplift. East of Oudtshoorn these remnants of old plains become more and more conspicuous, and they are very well developed in Uniondale, Willowmore, Knysna, Humansdorp, Uitenhage, Alexandria, and Albany. The sandy quartzose soils found on the Table Mountain series in the Folded Belt and Coast Belt are deficient in lime, potash, and phosphates, and in the damper areas they are very rich in organic matter; they are sour soils with an acid reaction, and they support a characteristic vegetation.

(14) *The Coast Belt* varies much in width and character. In the north-west the land slopes gradually to the sea either directly from the escarpment or with the intervention of hills made of hard rocks, such as the quartzites of Aughrabies or the granite of Moedverloren; south of the Olifants River, ranges made of the Table Mountain series, such as Konaquas, Prins Klip, the Piquetberg, and, largest of all, the Peninsula mountains, intervene between the Folded Belt and the shore, while the granite of Paarl Berg, Paarde Berg, the Saldanha Bay mass, and the Kapoc Berg range also break the slope. The ranges mentioned, consisting of the Table Mountain series, are made of gently inclined beds, and they are the relics of the outer rim of the Folded Belt; the rocks of the same series bordering the coast at many places between False Bay and Cape Infanta are scarcely more disturbed, but thence eastwards, Capes St. Blaize, St. Francis, and Receif lie within the Folded Belt. All these eastward projecting capes are due to the resistant Table Mountain series withstanding the attacks of the sea longer than the softer Bokkeveld and Uitenhage beds of the exposed bays to the north and east of them. Beyond Algoa Bay the rocks reaching the shore are of a more uniform character, and the coast becomes as straight as it is north of St. Helena Bay. Beyond the Great Fish River the slope to the coast is fairly gradual as far as St. Johns, where it is broken by the horst cut through by the Umzimvubu and left outstanding by denudation; and in Natal the gradient is interfered with by the unequal resistance offered by the Karroo beds and the older quartzites and granite. In the south of the Cape Province several points reach greater heights than 1000 ft. (Kogel Berg, 4152 ft. is the highest) within five miles of the shore, and in Pondoland heights over 1000 ft. are again found near the shore. The extensive plains lying some 800 or 1000 ft. above the sea and more or less deeply trenched by the rivers east of the Kogel Berg region limit the Coast Belt; they were formed at a time when the whole country was at a lower level than now. The straight portions of the coast are characterized by drowned valleys, i.e. valleys of which the lower ends are now occupied by salt-water lagoons, such as that at the mouth of the Umzimkulu, owing

to subsidence. Cliffs are rare on the coast ; those of the Peninsula are unique in South Africa on account of their height (800 ft. at Cape Point). Short ranges of cliffs are found between the Orange River and Port Nolloth and at Baboon Point and Cliff Point on the west coast ; on the east and west shores of False Bay and near Hermanus ; Cape Infanta and in George and Knysna on the south coast, and near Waterfall Bluff in Pondoland. Elsewhere there is a rocky or sandy shore with only low cliffs or sloping ground behind. Shingle beaches are rare ; sand is much more general, and on the west and south coasts sand beaches persist for miles. Sand dunes are frequently found immediately behind the shore ; they are extensively developed in the Malmesbury, Bredasdorp (Agulhas), Riversdale Districts, near Port Elizabeth, and in Zululand.

Note on the tabular statement of formations and the history of events recorded by the rocks :—

The statement is necessarily highly condensed, and disputed points, e.g. the equivalence or otherwise of the Waterberg and Cape systems, cannot be explained ; in such cases the writer's opinion is followed, though other views find considerable support.

The sub-division of South Africa adopted in this article is based for the most part on work done for the Geological Surveys of the Union and of the Colonies before Union ; this work is published in the maps and reports of those Surveys. The following references are to books and papers in which special attention is given to the physical features of the country :—

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A. Penck...........	" Der Drakensberg und der Quathlamba Bruch," Sitz. d. Kon. Preuss, Akad. d. Wiss., 1908. " Sud-Afrika und Sambesifalle," Gesel^{l}. Deutsch. Naturforsch., etc., verh., 1908.
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A. L. du Toit..... ..	" The Forming of the Drakensberg," Trans. South African Phil. Soc.. Vol. XVI, p. 53. "The Evolution of the River System of Griqualand West," Trans. Roy. Soc. South Africa, Vol. I, p. 347.

T. G. Trevor………	"The Physical Features of the Transvaal," in papers read at the joint meeting of the B. and S.A.A.A.S. in 1905, Vol. I, p. 335.
S. Passarge……….	"Sudafrika," 1908.
A. L. Hall………..	"The Geology of the Murchison Range." Geological Survey Memoir No. 6, 1912. "The Geology of the Barberton Gold Mining District." Geological Survey Memoir No. 9, 1918.

Stratified Formations.				Characters and Localities.	Maximum Thickness (in Feet).	Igneous Intrusions.	Earth Movements.
			Recent and Pleistocene (age relationships often uncertain)	Alluvia of the modern rivers Low- and high-level gravels, the latter possibly dating from the Cretaceous Ironstones (oudeklip), widely distributed Surface quartzites of the dry regions, Folded and Coast Belts Raised beaches with shells of living species Calcareous tufa in the drier regions Sands in the Kalahari and Bushmanland dating from the Cretaceous, and in other parts of the interior as well as in the Coast Belt Lignite-bearing sands of Knysna	— Over 400	—	Bending along the margin of the subcontinent gave rise to drowned valleys and raised beaches; uplift of the interior.
			Bredasdorp beds Alexandria beds (These are probably parts of one and the same series)	Marine inshore sandy limestones and conglomerates, often glauconitic, of the south coast districts, containing Mio-Piocene shells	Over 400	Volcanic pipes and fissures now occupied by plugs and dykes of kimberlite and melilite and nepheline-basalts	Uplift at close of Cretaceous and faulting in marginal regions. Encroachment of sea on south and east coasts.
Cretaceous System.			Need's Camp series (Danian)	Fossiliferous marine limestones, Buffalo River, East London			
			Umzamba series (Senonian)	Shelly limestones and pebble beds of Pondoland, Natal, and Zululand; conglomerates, of Umgazana and Embotyi	50		
			Cenomanian series	Clayey fossiliferous limestones of False Bay and Manuan Creek, Zululand	—	—	Faulting in region of Cape ranges.
	Uitenhage Series (Neocomian).		Sunday River beds	Fossiliferous marine clays and limestones of Uitenhage and Knysna			
			Wood beds	Fossiliferous estuarine sands and shales in Uitenhage district	Over 4,000		
			Enon beds	Conglomerates, sandstones, and shales of Uitenhage, Knysna, Riversdale, Oudtshoorn, and other districts south of the Karroo; non-marine fossils			
Carboniferous to Jurassic.	Stormberg Series.		Drakensberg beds	Basaltic and andesitic lavas and tuffs of Basuto Highland and South-Eastern region, Bushveld (Springbok Flats); basaltic and rhyolitic lavas of the Lebombo	4,000	Intrusion of basic rocks (Karroo dolerites and related rocks) throughout the region except Folded Belt	Emergence of land over Karroo region following restriction of area of deposition through rise of Cape ranges.
			Cave sandstone	Pale massive sandstones of Basuto Highland, South-Eastern region, Orange Free State, Bushveld, Limpopo, Lebombo	800		
			Red beds	Red and pale sandstones shales, and mudstones, in Basutoland, South-Eastern region, and Orange Free State	1,600		
			Molteno beds	Sandstones, shales, and conglomerates of South-Eastern region, Basutoland; coal in the Cape Province	2,000	—	Mountain building in the south and west of Cape Province (Cape ranges).
	Beaufort Series.		Burghersdorp beds	Red and purple shales and mudstones, pale sandstones; reptiles and other fossils; South-Eastern region and Upper Karroo	3,000		
			Middle Beaufort beds	Sandstones and shales; Lystrosaurus, South-Eastern region, Upper Karroo	1,000		
			Lower Beaufort beds	Sandstones, shales, and mudstones of Upper and Great Karroo, South-Eastern region, and south-eastern Transvaal, where it contains coal; many reptiles	Over 5,000		
	Ecca Series.		Upper Ecca	Predominantly shaley; Upper and Great Karroo, South-Eastern region, south-eastern Transvaal	700 In S.E. region. Over 6,000 in Great Karroo.	—	Long period of depression over whole region, specially marked in the south where Karroo deposits are thickest.
			Middle Ecca	Predominantly sandstones, coal measures of Natal and Transvaal; sandstones and shales, in Upper and Great Karroo	1,700		
			Lower Ecca	Shales and sandstones, thick in Great Karroo; Upper Karroo and South-Eastern region, Transvaal	1,400		
	Dwyka Series (Carboniferous).		Upper shales	Shales, carbonaceous shales, cherts, thin limestones; phosphate lenses in Great Karroo; not recognized in Transvaal or Natal	800		
			Tillite	Boulder mudstones and shales; hard till of glacial origin; thick in southern Cape and Natal; thins northwards; not developed, or removed, in much of Transvaal	1,400		
			Lower shales	Shales, sandstones, and quartzites, in Great Karroo and Folded Belt; transition beds from Cape system	1,000		
(Devonian and Carboniferous) Cape System.			Witteberg series	Quartzites and shales, in the Folded Belt	2,500		
			Bokkeveld series	Shales, sandstones, and quartzites, in Folded Belt; marine Devonian fossils	2,500	—	Mountain building in Bechualand, etc.
			Table Mountain series	Quartzites, sandstones, and shales; tillite in Cedarberg, in the Folded Belt, Pondoland, and Natal	5,000	—	Transgression of sea over Karroo region in Bokkeveld times.
Ages relative to Cambrian uncertain; mostly, if not all, pre-Cambrian.	Waterberg System.		Upper Waterberg	Sandstones, shales, and conglomerates, predominantly red, in Pretoria, Middelburg, Waterberg, Zoutpansberg, Natal; similar sediments with andesitic lavas and tuffs, in Langeberg, Koranaberg, in Kaap Plateau–Kalahari regions (Matsap beds)	5,000 (Matsap 7,000)	Intrusion of Bushveld igneous complex	
			Lower Waterberg	Chiefly volcanic rocks and thin shales, in Transvaal	2,000	—	Mountain building in south and west of Cape Province.
	Transvaal System.		Pretoria series	Shales, ferruginous and cherty beds, quartzites, and andesitic lavas, and tuffs, in Transvaal and Griqualand West, Ibiquas, Numees, and Groot Derm beds in Namaqualand; tillite in Pretoria and Numees beds	10,000	Intrusion of younger granites of Cape and Namaqualand	
			Campbell Rand series	Dolomites of Transvaal and Griqualand West; limestones of Namaqualand (Kaigas beds) and Neint Nababeep and of Van Rhynsdorp and Piquetberg, probably also of Cango and Humansdorp; clay slates and quartzites, of Malmesbury series	3,500		
			Black Reef series	Quartzites, conglomerates, and shales, in Transvaal and Griqualand West; quartzites of Nieuwerust series and Stinkfontein series in Namaqualand	2 600		
	Ventersdorp System.		Pniel series	Andesitic lavas, tuffs, conglomerates, shales, and sandstones in Middle Veld region and Prieska; probably the Koras lavas and sediments belong here; they occur in Gordonia and Kenhardt	5,000	—	Minor uplifts in Transvaal and Bechuanaland, etc.
			Kuip series	Lavas, limestones, cherts, sandstones, and arkose, near Omdraai's Vley	1,500		
			Zoetlief series	Acid lavas, shales, quartzites, and conglomerates in Vryburg, Motiton, Prieska	1,500		
	Witwatersrand System.		Kimberley–Elsburg series	Shales at base, quartzites, conglomerates above; Zuikerboschrand, hills south of Witwatersrand	6,000	Intrusion of dykes in southern Transvaal and Vredefort granite	
			Main–Bird series	Quartzites, grits, conglomerates, and lavas; Houtpoort hills; mining ground on the Witwatersrand	3,000		
			Jeppestown series	Shales, thin quartzites; Johannesburg built on them	4,000		
			Government Reef series	Quartzites, shales, ferruginous rocks, and conglomerates; Witwatersrand	6,000		
			Hospital Hill series	Quartzites, shales, ferruginous rocks, arkose; Witwatersrand	5,000		
	Correlation with Swaziland or Witwatersrand System Uncertain.	Pongola series	Upper Pongola beds	Shales, quartzites, and conglomerates, in northern Natal and Zululand			
			Lower Pongola beds	Quartzites, phyllites, lavas, in northern Natal and Zululand			
	Swaziland System (Intercorrelation Unknown).	Kheis series	Abel's Kop	Schists, limestones, and banded ironstones, in south-western Transvaal			
			Wilgenhout Drift beds	Sedimentary and volcanic rocks, in Prieska, Kenhardt, and Gordonia	—	Intrusion of Palabora igneous complex	REMARKS. On account of the complicated structure of the country occupied by the pre-Witwatersrand or pre-Transvaal rocks, and their isolation one from another, their relative ages are not known; and the significance of their members is little understood.
			Kaaien beds	Quartzites and schists, in Prieska, Kenhardt, and Gordonia			
			Marydale beds	Sedimentary and volcanic rocks, in Prieska, Kenhardt, and Gordonia			
			Kraaipan series	Schists, banded ironstones, and volcanic rocks, in Bechuanaland			
			Moodies	Quartzites, banded ironstones, schists and conglomerates, in northern and eastern Transvaal	25,000		
			Schists	Schists of sedimentary and volcanic origin, in Namaqualand			

CHAPTER II.

CLIMATE AND METEOROLOGY.

By G. W. Cox.

WITH

NOTES ON THE RAINFALL.

By R. Marloth, Ph.D.

I.—Climate and Meteorology.

1. *Physical Characteristics of the Union.*—An important factor in the climate of South Africa is found in the topography of the country. There are essentially four elevated plateaux; the *Coast Flats*, with an elevation of 500 to 600 ft. and a variation in width from thirty miles in South-West Africa to three miles or even less in the south-east of the Cape Province; the *Little Karroo*, a narrow stretch of from fifteen to twenty miles, with an elevation of about 1500 ft.; the *Great Karroo* at an altitude of from 2000 to 3000 ft., and the *Northern Karroo* with an elevation of 4000 ft., rising to 6000 ft. in the eastern portions. These plateaux are separated by steep escarpments, rising a considerable height above them.

2. *Temperature.*—One effect of this formation, and the most apparent, is to counteract the ordinary increase of temperature with decrease of latitude giving a remarkable uniformity to the mean annual temperature of the different parts of the Union as shown below:—

UNIFORMITY OF MEAN ANNUAL TEMPERATURE AT CERTAIN PLACES IN THE UNION.

Station.	Latitude.		Longitude.		Altitude.	Mean Annual Temperature.
	Deg.	Min.	Deg.	Min.	Feet.	Deg. Fahr.
Mossel Bay	34	11	22	9	105	63·3
Capetown (Royal Observatory)	33	56	18	29	40	62·0
Graaff-Reinet	32	16	24	32	2,460	63·6
Umtata	31	35	28	46	2,400	63·0
O'okiep	29	36	17	52	3,036	63·0
Pretoria	25	45	28	11	4,392	63·5

Temperature is, moreover, affected by the relatively small area of the sub-continent making it possible for the ocean to exert an influence almost, if not entirely, throughout the country, and to impart an equability to the climate which would otherwise be absent. As the western shores of the Union are, however, washed by the cold Benguela current, and the eastern and southern shores by the warm Mozambique current, different temperature effects are produced according to the influence under which a particular part may fall. This is apparent in the following table:—

CONTRASTS IN TEMPERATURE UNDER INFLUENCE OF DIFFERENT OCEAN CURRENTS.

Station.	Latitude.		Longitude.		Altitude.	Mean Annual Temperature.
	Deg.	Min.	Deg.	Min.	Feet.	Deg. Fahr.
Port Nolloth......	29	16	16	52	40	57·5
Port St. Johns....	31	38	29	35	40	66·9
Capetown (Royal Observatory)....	33	56	18	29	40	62·0
Port Elizabeth....	33	58	25	37	176	64·0
Mouille Point.....	33	54	18	24	20	62·6
Simonstown.......	34	12	18	26	12	64·7
Ceres.............	33	22	19	20	1,493	59·4
Grahamstown.....	33	18	26	32	1,800	62·3

The mean daily range of temperature generally increases from the coast landwards, averaging about 12° F. along the *south coast* and about 25° F. on the *high veld.* The extreme shade temperatures recorded are 125° F. at Main Tembuland in January, 1903, and 6° F. at Palmietfontein in the north-east of the Cape Province in June, 1902. Frosts of sufficient severity to freeze standing waters are practically unknown along the coasts ; but in the interior between May and the middle of September when, under anticyclonic conditions, clear skies and low humidity facilitate nocturnal radiation, they are fairly frequent. Frosts may occur as early as March and as late as October.

3. *Humidity.*—Although the amount of water vapour in the air decreases from the coast inland the north-easterly and easterly winds of the summer months convey to the *high veld* more moisture than is probably present on the same plane at the coast. The curves of Fig. 1 below illustrate this, and in some measure indicate to what extent the air is deprived of moisture in mounting the plateaux. Fig. 3 represents graphically the mean monthly maximum and minimum temperatures and relative humidity at eight stations.

4. *Rainfall.*—The average annual rainfall over the Union is approximately 19 inches, which is distributed as follows :—

AREAS SUBJECT TO AVERAGE ANNUAL RAINFALLS BETWEEN CERTAIN LIMITS.

Average Annual Rainfall.	Cape.	Orange Free State.	Transvaal.	Natal.	Union.
Inches.	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.
Under 5·0..............	6,501	—	—	—	6,501
5·1 to 15·0...........	177,677	573	—	—	178,250
15·1 „ 25·0...........	66,817	32,660	70,764	—	170,241
25·1 „ 35·0...........	21,771	17,156	33,632	21,227	93,786
35·1 „ 50·0...........	4,071	—	5,536	14,057	23,664
Over 50·0..............	129	—	518	—	647
Total area........	276,966	50,389	110,450	35,284	473,089

The positions of these areas are shown in Map No. 2, and it is seen that there is a general decrease in amount of precipitation from east to west, excepting in the south where the effect of winter rains is apparent.

With regard to seasonal distribution, Map No. 1 shows that within the Union are regions of well-defined summer and winter rainfall, precipitation occurring almost entirely during the months October to March in the north-west and during the months April to September in the south-west.

This distribution is related to the movement and action of the permanent anti-cyclones which lie off the west coast of the Cape Province and off the east coast between the Cape Province and Australia. This belt of high pressure migrates northwards and southwards with the sun, and in addition the centres or cores have a lateral displacement from month to month. During April and May that to the east of the Cape Province moves westwards to the African coasts, while that on the west coast moves eastwards. At the same time an important secondary core appears over the land, where barometric pressure increases until June or July. The movement northwards of the anti-cyclonic belt brings the west and south-west coastal regions of the Cape Province under the influence of A-shaped depressions connected with the cyclonic system to the south; and it is the westerly winds associated with the rear of these depressions which are the rain-bearers for the west and south-west coastal districts of the Cape Province, where over 75 per cent. of the annual precipitation occurs during the winter. As will be seen, the area thus watered is not extensive. Originating in the cold parts of the Atlantic the capacity of these westerly winds for moisture is small, and after condensation, forced by the elevated ground which forms the western boundaries of the plateaux, they soon cease to act as rain-bearers.

In September and October the high pressure moves off the land, merging into the South Indian anti-cyclone, which then returns eastwards to its summer position just off the west coast of Australia, and the South Atlantic anti-cyclone which lies a short distance from the west coast of the Cape Province. The north-easterly and easterly winds associated with the former introduce the moisture which is deposited over the greater part of the Union during the summer months. These winds when leaving the Indian Ocean are warm and their capacity for moisture is great; and although they deposit a considerable amount of moisture in ascending the plateaux (evidence of which is seen in the mist belts of the more easterly parts of the Union), and so decrease their absolute humidity (Fig. 1), they still reach the interior with a comparatively high humidity (Figs. 1 and 3).

Fig. 2 presents graphically the rainfall at the Royal Observatory, Capetown, and the Union Observatory, Johannesburg, respectively situated in typical winter and summer rainfall areas.

As an indication of the great fluctuations in the amount of precipitation at the same place, Table 2, containing the yearly records for nine stations since their inception, may be referred to. It will be noticed that in only one case is the difference between the lowest and highest amounts less than the average annual fall.

Fig. 1.

HUMIDITY—LOURENCO MARQUES AND JOHANNESBURG.

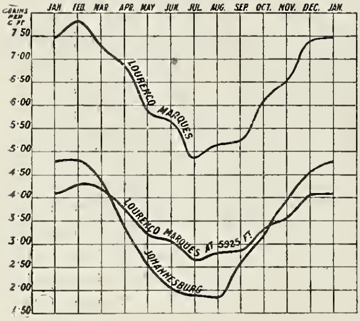


Fig. 2.

MEAN MONTHLY RAINFALL—JOHANNESBURG AND CAPETOWN.

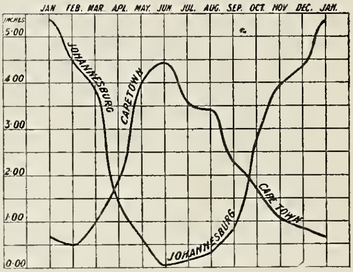
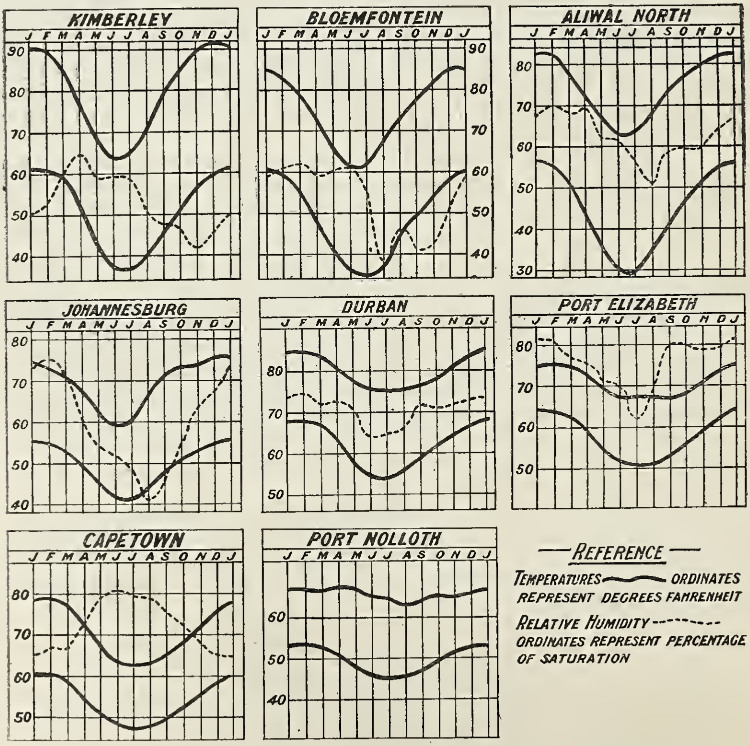


Fig. 3.

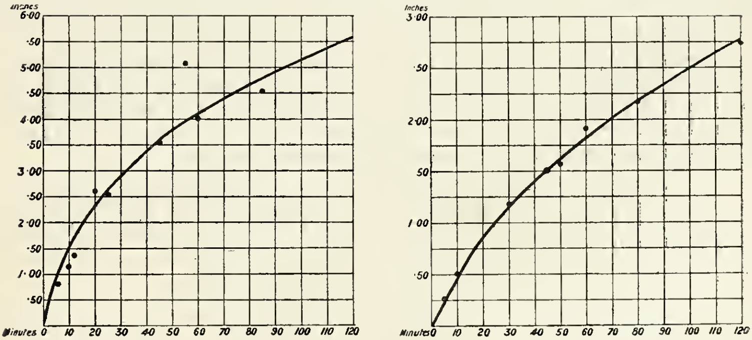
MEAN MONTHLY MAXIMUM AND MINIMUM TEMPERATURES AND RELATIVE HUMIDITY.



Precipitation in the interior takes place mostly through the agency of thunderstorms, the occurrence of which is facilitated by a steep temperature gradient from about the 3500-ft. plane. Such storms are also frequent on the eastern slopes of the plateau, and the accompanying precipitation is sometimes of great intensity. By taking the heaviest falls recorded in the Transvaal during various intervals of time the curves of Fig. 4 have been obtained as representing the probable maximum amount of rainfall to be expected during a stated interval of time. The eastern slopes of the *main* and *Zoutpansberg* plateaux and part of the north-eastern *high veld* fall under the eastern division, the extreme south-western district of the Province, under the south-western division, and the remainder of the country, excluding the unhealthy regions of the *low veld*, under the central. The most remarkable fall yet recorded occurred at Wolhuterskop on the 18th February, 1915, when 4·19 in. fell in thirty minutes.

Fig. 4.

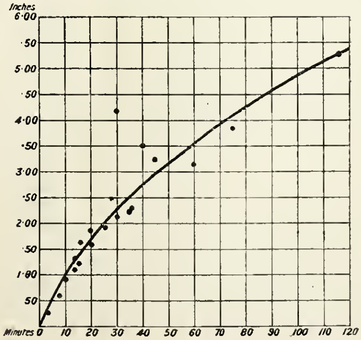
PROBABLE MAXIMUM RAINFALL.



Eastern Division.

South Western Division.

Central Division.



5. *Hail and Snow.*—Hail has been observed over the Union in three different forms, viz.: (*a*) *soft hail*, which consists of small rounded pellets about the size of peas, opaque and white, like compacted snow; this form occurs mostly in showers of short duration in spring and early summer, and sometimes in winter, when it is occasionally followed by snow; (*b*) icy pellets, larger, more compact and transparent, like frozen raindrops. These are known as *Riesel* in Germany, but there is no equivalent in English. although the American Bureau define this as sleet. This *Riesel* constitutes the transition stage between *soft hail* and (*c*) *true hail*, which consists of pieces of ice of irregular form but mostly pear or mushroom shaped, with a central nucleus surrounded by a series of more or less concentric hard and soft, alternately clear and opaque, layers. This *true hail* is associated with thunderstorms, and occurs mostly during the warmest period of the year. Although usually regarded as a summer phenomenon, such storms may occur during the winter months, as at Fauresmith on the 19th June, 1900. A fourth form of hail, occurring at times associated with *true hail*, consists of irregularly-shaped pieces of ice-like fragments of larger pieces which have been broken by collision with one another. Hail frequently causes considerable damage to orchards and growing crops, even at times killing numbers of small stock. Hailstorms occur on an average 106 days in the year over the Transvaal, mostly in the months of October to January, the maximum being in November, whilst over the Cape Province the number of days is 105, mostly from November to March, with the maximum in February.

Snow is of infrequent occurrence and usually confined to the mountainous districts. On the flats along the coast it is rarely met, and its infrequency on the *high veld* is indicated by the fact that in only eleven of fifty-seven years has it been recorded in the Transvaal. Map No. 2 shows the general distribution of precipitation over the country.

6. *Evaporation.*—Evaporation from free water surfaces is considerable over the whole country, the monthly means at Johannesburg, Capetown, and Dunbrody being :—

MONTHLY MEANS OF EVAPORATION.

Month.	Johannesburg (Union Observatory).	Capetown (Molteno Reservoir).	Dunbrody (near Port Elizabeth).
	Inches.	Inches.	Inches.
January	6·51	10·39	9·10
February	5·65	9·82	7·61
March	5·07	9·10	6·55
April	5·13	5·75	5·01
May	5·10	3·16	3·83
June	4·35	2·48	3·59
July	4·91	3·50	3·72
August	6·60	3·62	5·03
September	7·91	5·08	5·36
October	8·41	6·80	6·37
November	7·63	8·83	7·32
December	7·40	10·04	8·70
TOTAL	74·67	78·57	72·19

7. *Hours of Sunshine.*—The mean number of hours of bright sunshine experienced daily at Capetown, Kimberley, and Johannesburg as compared with similar data for other parts of the world is given below :—

MEAN DAILY HOURS OF SUNSHINE.

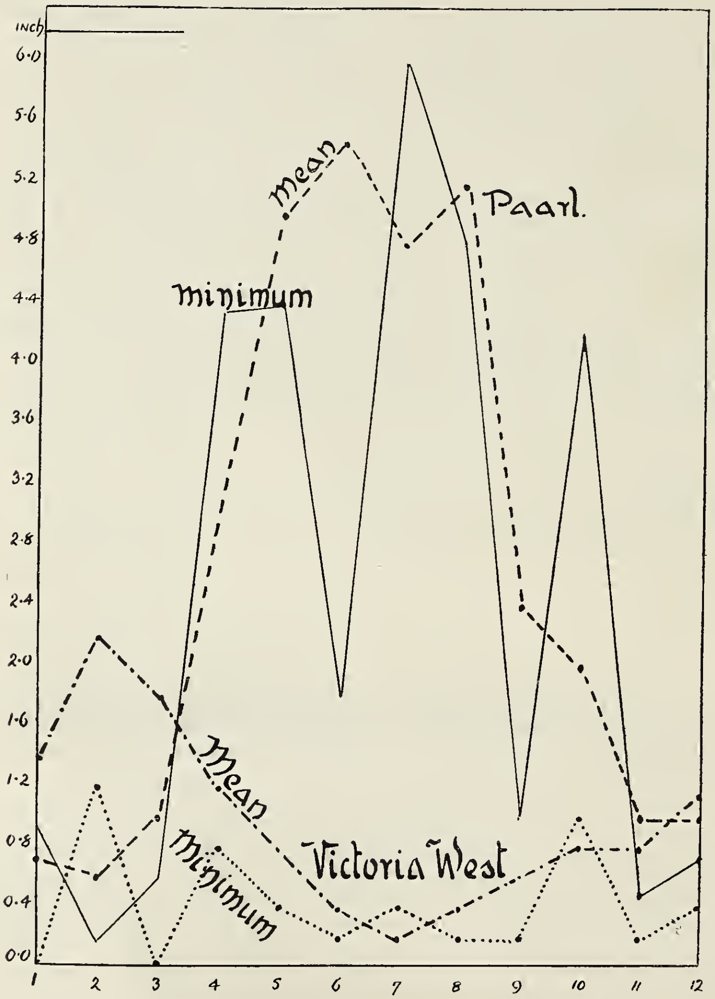
Month.	Capetown (Royal Observatory).	Kimberley.	Johannesburg (Union Observatory).	London.	Bucharest.	Calcutta.	Baltimore.	New York.	Cordoba.
	Hours.	Hours.	Hours.	Hours.	Hours.	Hours.	Hours.	Hours.	Hours.
January..	9·71	9·90	7·8	1·4	2·5	8·9	4·9	5·1	9·1
February.	9·78	9·14	7·5	1·8	3·4	9·0	6·4	6·2	8·5
March....	8·36	8·83	7·2	3·4	4·5	9·5	6·8	6·5	7·6
April.....	6·50	8·72	8·7	4·6	6·1	9·9	7·9	7·7	7·1
May......	6·10	8·64	8·8	6·5	8·0	9·4	7·7	8·1	6·6
June.....	4·81	8·64	9·0	6·2	8·7	5·1	9·2	9·0	5·3
July......	4·90	8·90	9·2	6·3	10·4	4·1	9·2	8·4	5·6
August...	5·93	9·23	9·9	5·9	10·1	3·6	8·4	8·3	7·1
September	6·76	9·78	9·3	4·3	7·7	5·3	8·4	7·5	7·6
October..	7·92	10·06	9·0	3·1	5·3	8·3	6·7	5·8	8·0
November	9·16	10·76	8·9	1·7	3·4	8·5	5·0	5·0	8·9
December	10·17	10·26	8·6	1·1	2·1	8·1	4·9	4·9	8·8
Year..	7·51	9·41	8·7	3·8	6·0	7·5	7·1	6·9	7·5
Percentage of total possible hours...	66	78	73	29	49	62	58	56	63

II.—Notes on the Rainfall.

The information contained in the preceding paragraphs will give a general idea of the climatological conditions prevailing in South Africa, but the study of the relationship existing between the vegetation of the country and its climate requires various other data especially with regard to the rainfall.

One of the principal shortcomings of such statistical tables and maps for our purpose is the fact that they are based on the means of long periods, and that consequently the extremes are obliterated. But the extremes, and especially the seasons and years with the minimum rainfall are often of greater importance from a botanical point of view than the average amount, just as the figure for the mean annual temperature of a locality is quite insufficient by itself, for two places may have the same mean annual temperature, but a widely different temperature curve during the year, e.g. Springbok in Namaqualand and Pietermaritzburg in Natal, both with an annual mean of 72·5° F.

If the fluctuations of the rainfall were of the same magnitude in the various parts of the country, the ordinary maps showing the annual total and the seasonal distribution might be sufficient also for our purpose, but there are very great differences in this respect in South Africa. In order to readily demonstrate these facts we have selected two localities from two different botanical regions, viz., Paarl and Victoria West.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Mean
Paarl.
Minimum
Mean
Minimum
Victoria West

RAINFALL AT PAARL AND VICTORIA WEST. THE MEAN OF 10 YEARS. THE ANNUAL MINIMUM FOR THE PERIOD 1885–1894.

		Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Paarl.........	Mean	0·70	0·63	0·90	2·01	4·94	5·39	4·35	5·00	2·92	2·31	1·19	0·81	31·15
	Min	0·88	0·12	0·56	4·31	4·39	1·80	5·99	4·79	1·04	4·19	0·48	0·64	29·19
Victoria West	Mean	1·31	2·18	1·76	1·09	0·81	0·41	0·19	0·33	0·50	0·67	0·77	1·02	11·04
	Min.	0·04	1·20	0·00	0·72	0·28	0·24	0·36	0·16	0·16	1·00	0·08	0·24	4·48

Table and diagram given here, although referring only to two stations, throw a good deal of light on various questions connected with our work, but it will not be possible to discuss them all, and we shall have to be satisfied with pointing out a few specially prominent features of the subject.

(1) The great difference in the total rainfall, viz., 32 and 11 in.
(2) The opposite seasons, May–August, bringing 81 per cent. of the total in the one case and 16 per cent. in the other.
(3) The great difference in the fluctuations during the period discussed.

For Paarl one finds the minimum to be 82 per cent. of the mean, but for Victoria West only 40 per cent., and that out of a total of 11 in. Obviously it must be a far more serious matter for the plants of Victoria West to receive only 4·4 in. of rain during a whole year instead of 11 in., than it will be for the vegetation of the Paarl valley to have 26 out of 32 in. But this is not all, for the year with 4·4 in. of rain is not the worst that these parts of the country have experienced. In 1903 the adjoining district of Britstown, which shows the same annual mean as Victoria West, received only 2½ in. of rain. It will be easily understood from these figures that it is the year with the minimum rainfall which decides the fate of many a plant, be it within the area of the species or, as in the case of pioneers, beyond its original limit, and it is consequently of the greatest importance for our purpose to consider the minimum rainfall as well as the average for the year.

A comparison of Map No. 2 (average annual rainfall) with the Minimum Rainfall Map (No. 3) will demonstrate two important features of the problem, viz. :—

(1) The great difference in the limitation of the areas of equal amounts in the two maps ; and
(2) the close parallelism between the various minimum rainfall areas and the vegetational districts of the country, especially with regard to the southern, south-western, and central regions.

There is another feature well demonstrated in the diagram, viz., the greater irregularity of the summer rainfall in the south-west when compared with the figures for the winter, the irregularity being quite as bad as in the Karroo and other parts referred to. The mean for the four months—December–March—at Paarl is 3 in., but there occur years in the south-west without any summar rain whatever, e.g. at Wellington, Piquetberg, Worcester, etc., and the records for the latter station show that sometimes even the six months—November–April—bring only a total of two-fifths of an inch. In order to avoid any misunderstanding it has to be pointed out that these records refer only to the towns and the plains surrounding them, but not to the mountains in their neighbourhood, which receive a much greater amount of precipitation in the form of rain as well as from mist clouds during the summer.

Although the subject is fascinating and although a proper study of the manifold relations existing between the climate and the indigenous vegetation is of the greatest importance also to the agriculturist and the stock-breeder of South Africa, we cannot enter into it here more fully for the present. Some of the work necessary for a solution of the problems involved has been done, more of it remains to be done. Readers specially interested in the subject will find some more information in the following four publications, the third one specially with regard to its influence on the vegetation :—

Buchan, A..... "A Discussion of the Rainfall of South Africa during the Ten Years 1885–94," with maps ; Capetown, 1897.

Sutton, J. R... "An Introduction to the Study of South African Rainfall" (1880–1901); Trans. S.A. Phil. Soc., Vol. XV, 1904 (with numerous tables).

Marloth, R..... "Das Kapland"; the chapters on climatology, pages 26–41, 65–71, 187–189, 214, and 257–258, with map of winter rains (May–August) and minimum rainfall, Jena, 1908.

Sutton, J. R... "A Contribution to the Study of the Rainfall Map of South Africa," Trans. Roy. Soc. S.A., Vol. IX. 4, 367, 1921.

— "Official Year Book." Union of South Africa.

MEAN ANNUAL RAINFALL.

Table (i).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
CAPE OF GOOD HOPE.							
Aberdeen (Bedford)	24·03	32·28	1878–1915	12·52	43	71	29
Aberdeen (Gaol)	24·03	32·28	1881–1915	12·14	41	69	31
Aberdeen Road	24·20	32·46	1885–1915	10·11	29	66	34
Adelaide	26·18	32·43	1891–1915	19·10	81	67	33
Albert Vale	26·00	32·45	1903–1915	18·65	84	66	34
Alexandria	26·25	33·38	1885–1915	27·55	75	52	48
Alice	26·50	32·47	1878–1909	22·81	73	66	34
Alicedale	26·05	33·20	1878–1915	17·92	49	57	43
Aliwal North (Gaol)	26·40	30·42	1883–1915	21·14	59	74	26
Aliwal North (Brown)	26·40	30·42	1880–1907	24·36	84	75	25
Amalienstein	21·29	33·29	1869–1914	13·07	61	52	48
Anenous	17·35	29·14	1900–1915	5·55	28	24	76
Armadale	25·28	33·26	1897–1915	16·19	40	59	41
Atherstone	26·25	33·19	1881–1915	22·70	86	61	39
Avoca	23·53	29·00	1833–1909	13·35	37	78	22
Avoca	27·32	30·45	1888–1915	39·06	96	70	30
Baakensrug	23·16	32·18	1890–1915	9·19	25	65	35
Balfour	26·40	32·31	1886–1914	28·08	68	72	28
Barkly East	27·36	30·58	1884–1915	23·66	77	73	27
Barkly West	24·32	28·32	1884–1915	17·75	61	78	22
Bazeya	28·24	31·35	1901–1915	52·20	116	79	21
Beaufort West	22·36	32·21	1878–1915	9·46	36	66	34
Bedford (Gaol)	26·06	32·41	1878–1915	27·98	103	69	31
Bedford (Hall)	26·06	32·41	1892–1915	26·83	127	68	32
Bellsbank	24·24	28·08	1893–1915	17·18	41	83	17
Berlin	27·38	32·53	1892–1915	23·33	36	69	31
Bethesda Road	24·46	31·54	1900–1915	11·02	30	70	30
Blaauwberg Strand	18·28	33·47	1895–1915	15·02	93	23	77
Blaney	27·31	32·50	1882–1915	20·69	53	67	33
Blikana	27·36	30·34	1899–1915	29·13	90	75	25
Bloemhof	24·43	31·59	1899–1915	11·19	39	65	35
Boetsap	24·25	27·56	1886–1915	20·60	52	83	17
Belo	27·38	32·23	1898–1915	23·22	64	74	26
Boschfontein	24·36	30·47	1892–1906	12·39	39	69	31
Brakfontein	23·02	31·49	1872–1915	10·06	35	71	29
Bredasdorp	20·02	34·33	1878–1915	19·81	85	42	58
Britstown	23·31	30·35	1887–1915	11·34	33	65	35
Buffelsnek	23·10	33·53	1890–1915	47·69	124	55	45
Buffelsfontein	26·40	31·22	1885–1915	21·98	54	73	27
Burgersdorp (Gaol)	26·19	31·02	1887–1915	20·74	57	73	27
Burgersdorp (Le Roux)	26·19	31·02	1878–1901	20·84	64	71	29
Butterworth	28·08	32·21	1889–1915	25·06	93	70	30
Cala	27·08	32·35	—	—	—	—	—
Cala	27·43	31·31	1887–1915	24·22	60	78	22
Caledon	19·25	34·14	1877–1915	20·68	92	34	66
Calitzdorp	21·42	33·32	1877–1915	8·52	31	57	43
Calvinia	19·46	31·29	1878–1915	7·74	29	31	69
Campbell	23·43	28·48	1885–1907	13·64	42	78	22
Camps Bay	18·23	33·57	1899–1915	24·25	86	25	75
Cape Angulhas	20·01	34·50	1881–1915	16·94	89	33	67
Cape Point	18·30	34·21	1900–1915	12·31	95	27	73
Cape St Francis	24·50	34·12	1880–1915	26·78	92	40	60

(i) MEAN ANNUAL RAINFALL—(*continued*).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
CAPE OF GOOD HOPE—(*continued*).							
Capetown—							
Fire Station	18·25	33·55	1862–1915	25·64	91	22	78
Hospital	18·26	33·56	1905–1915	21·74	108	23	77
Molteno Reservoir	18·24	33·54	1887–1915	33·16	104	23	77
Platteklip	18·25	33·57	1882–1915	45·12	110	24	76
Royal Observatory	18·29	33·56	1841–1915	25·60	97	23	77
Sea Point Hall	18·23	33·56	1900–1915	24·45	100	27	73
Signal Hill	18·24	33·55	1882–1915	18·63	87	23	77
South African College	18·25	33·55	1885–1911	31·40	94	23	77
Woodstock Hall	18·27	33·59	1904–1915	28·07	112	26	74
Carnarvon	22·08	30·58	1878–1915	8·01	29	66	34
Carnarvon Farm	26·40	31·34	1880–1915	20·59	76	76	24
Cata	27·08	32·35	1899–1915	38·79	89	72	28
Cathcart (Forest)	27·09	32·18	1905–1915	25·14	84	77	23
Cathcart (Gaol)	27·10	32·18	1879–1915	26·17	72	76	24
Centlivres	25·30	33·39	1899–1915	13·48	45	53	47
Ceres	19·19	33·22	1877–1915	41·29	67	23	77
Cheviot Fells	26·05	32·19	1891–1915	18·60	65	61	39
Chiselhurst	27·55	32·58	1900–1915	33·37	96	62	38
Clanwilliam (Downes)	18·55	32·10	1868–1915	8·57	46	21	79
Clanwilliam (Gaol)	18·55	32·10	1869–1915	8·59	46	22	78
Claremont (Bishops Court)	18·27	33·59	1879–1913	55·85	111	22	78
Claremont (The Grove)	18·28	33·58	1877–1909	56·12	102	18	82
Cofimvaba	27·35	32·00	1894–1915	24·43	76	79	21
Colesberg	25·07	30·43	1878–1915	15·65	46	70	30
Colonies Plaats	24·48	32·00	1883–1902	13·72	48	70	30
Concordia	17·56	29·32	1890–1915	6·40	29	30	70
Concordia	23·03	34·02	1891–1915	37·90	113	54	46
Contest	27·15	31·58	1886–1915	20·20	69	75	25
Cookhouse	25·48	32·44	1898–1915	16·19	50	71	29
Corndale	24·03	32·23	1895–1909	12·29	40	73	27
Cradock (Gaol)	25·38	32·10	1878–1915	14·76	49	71	29
Cradock (Station)	25·38	32·10	1881–1909	15·20	58	68	32
Cranemere	25·00	32·30	1883–1915	12·89	43	65	35
Crawley	27·16	32·25	1888–1915	18·62	52	76	24
Cullendale	26·12	32·39	1884–1915	24·47	73	69	31
Culmstock	25·27	31·33	1898–1915	11·21	33	73	27
Cwebe	28·55	32·12	1901–1915	40·91	78	67	33
Cyphergat	26·25	31·27	1885–1915	21·16	50	73	27
Daggaboer's Nek	25·52	32·32	1887–1915	18·70	62	67	33
Danger Point	19·18	34·37	1901–1915	24·25	93	31	69
De Aar	24·01	30·39	1888–1915	13·31	39	69	31
De Doorns	19·44	33·29	1901–1915	11·66	27	21	79
De Hoop	19·56	33·46	1898–1915	16·42	27	43	57
De Kruis	23·51	32·06	1888–1915	13·69	38	62	38
De Puts	25·18	31·36	1882–1893	13·53	37	71	29
Dohne	27·28	32·32	1881–1915	25·99	62	74	26
Dontsah	27·14	32·37	1899–1915	35·01	104	69	31
Doorskuilen	23·22	30·36	1898–1909	10·46	25	66	34
Dordrecht	27·03	31·22	1878–1915	23·50	76	75	25
Douglas	23·46	29·03	1883–1915	13·83	37	77	23
Dreunberg	26·19	30·58	1903–1915	18·06	53	74	26
Droogefontein	25·30	31·24	1894–1909	11·83	34	74	26
Drummond Park	26·21	32·01	1888–1911	19·19	47	76	24
Durbanville	18·39	33·49	1900–1915	26·05	73	24	76
Dunbrody	25·28	33·30	1885–1915	15·18	70	58	42
Dunedin	22·48	31·57	1893–1915	7·87	20	64	36
Dunmurry	22·42	28·18	1893–1915	13·78	45	74	26
East London (East)	27·54	33·01	1882–1915	33·39	103	60	40
East London (West)	27·53	33·02	1880–1915	25·75	85	58	42
Eerste River	18·44	34·02	1892–1915	21·89	72	24	76
Elgin Plantation	19·01	34·09	1902–1915	43·87	95	29	71
Ellesmere	26·20	30·42	1884–1915	18·50	58	73	27
Elliotdale	28·42	31·57	1892–1915	26·08	65	70	30
Elsenberg	18·50	33·51	1903–1915	26·97	93	23	77
Emerald Hill	25·36	33·58	1882–1915	30·79	114	47	53
Engcobo	28·00	31·41	1890–1915	30·98	80	76	24
Eskdale	24·00	29·29	1890–1903	13·14	25	74	26
Evelyn Valley	27·15	32·41	1887–1915	70·20	150	70	30
Exell Park	27·08	32·10	1900–1915	17·18	45	75	25
Ezeljagt	22·36	33·48	1883–1909	14·98	31	39	61
Fairholt	25·58	32·29	1886–1910	20·57	56	67	33
Fish River	25·25	31·55	1898–1915	10·61	34	74	26
Flagstaff	29·31	31·04	1900–1915	35·72	108	73	27
Forest Hall	23·31	33·59	1890–1902	29·25	108	56	44
Fort Beaufort	26·40	32·46	1879–1915	21·65	68	68	32

(i) MEAN ANNUAL RAINFALL—(*continued*).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
CAPE OF GOOD HOPE—(*continued*).							
Fort Beaufort (Gregory)..	26·40	32·46	1882–1905	24·54	85	68	32
Fort Cunynghame........	27·27	32·29	1896–1915	30·47	99	73	27
Fort Fordyce............	26·30	32·41	1898–1915	29·25	94	69	31
Fort Jackson............	27·42	32·55	1882–1915	25·41	56	64	36
Fountain Head..........	26·32	32·24	1893–1915	23·86	58	68	32
Fraserburg...	21·31	31·55	1878–1915	6·66	33	57	43
Fraserburg Road........	22·00	32·46	1881–1915	4·75	17	66	34
Gannapan................	22·11	30·23	1880–1915	4·16	12	65	35
Garies..................	17–59	30·33	1885–1915	5·19	26	20	80
Geelbeek's Vlei..........	22·05	34·05	1881–1906	16·67	67	52	48
George..................	22·29	33·57	1878–1915	34·36	125	57	43
Glencairn...............	26·49	32·25	1886–1915	30·84	77	67	33
Glenconner..............	25·10	33·24	1884–1915	12·07	31	59	41
Glen Harry..............	24·47	32·07	1900–1915	11·58	42	63	37
Glen Roy................	26·28	32·18	1898·1910	18·12	47	66	34
Glen. The...............	24·48	32·03	1880–1891	17·05	40	68	32
Goliad's Kraal...........	24·37	32·06	1863–1895	14·87	43	67	33
Graaff-Reinet	24·32	32·16	1861–1915	14·64	52	66	34
Graaff-Reinet (Gaol).....	24·32	32·16	1881–1915	13·98	55	65	35
Grahamstown (Gaol).....	26·32	33·18	1877–1915	28·79	89	61	39
Grahamstown (Hospital)..	26·32	33·20	1880–1896	28·34	86	61	39
Great Brak River........	22·14	34·03	1900–1915	20·41	87	58	42
Griquatown..............	23·15	28·51	1883–1915	13·08	43	72	28
Groot Constantia........	18·25	34·02	1888–1915	45·87	94	23	77
Groot Drakenstein.......	19·01	33·52	1893–1915	35·61	92	24	76
Grootfontein............	21·17	33·07	1899–1915	4·16	15	60	40
Grootvader's Bosch.	20·52	33·59	1898–1915	40·68	83	57	43
Hankey..................	24·53	33·50	1892–1915	16·79	44	53	47
Hanover.................	24·26	31·04	1878–1915	13·31	43	67	33
Harkerville..............	23·12	34·03	1888–1915	37·92	115	51	49
Heatherton Towers.......	26·34	33·09	1897–1915	13·67	39	62	38
Heidelberg	20·58	34·05	1878–1915	17·12	82	51	49
Herbertsdale............	21·46	34·02	1886–1900	17·37	64	49	51
Herschel................	27·09	30·37	1882–1915	28·20	68	73	27
Hex River...............	19·36	33·29	1889–1915	15·03	36	22	78
Hillmoor................	26·03	31·14	1888–1915	14·75	49	71	29
Hofmeyr.................	25·47	31·38	1898–1915	13·82	36	71	29
Hogsback................	26·55	32·36	1885–1915	51·34	114	70	30
Hopetown...............	24·05	29·37	1878–1915	12·42	43	76	24
Houdconstant...........	24·12	34·02	1879–1889	18·46	37	68	32
Houwhoek...............	19·17	34·13	1886–1900	22·93	62	29	71
Hughenden..............	26·10	30·47	1904–1915	14·75	50	76	24
Humansdorp............	24·46	34·02	1878–1915	26·88	92	50	50
Ida......................	27·39	31·25	1886–1915	27·34	76	77	23
Idutywa.................	28·18	32·06	1889–1915	21·77	59	72	28
Insikeni.................	29·35	30·09	1901–1915	43·19	130	83	17
Isidenge.................	27·21	32·40	1885–1915	40·52	122	68	32
Jamestown..............	26·49	31·07	1879–1915	21·99	53	72	28
Jansenville...	24·40	32·56	1878–1915	10·81	41	65	35
Kamfer's Kraal..........	23·03	32·14	1877–1915	8·36	37	67	33
Karnmelk's River	19·42	34·22	1898–1911	20·37	79	36	64
Karree Kloof............	23·23	29·49	1900–1915	10·11	25	73	27
Katberg (Lower Gauge)..	26·40	32·29	1882–1915	43·01	95	74	26
Katberg (Upper Gauge)..	26·40	32·29	1882–1897	53·28	—	75	25
Keilands................	27·34	32·13	1890–1915	20·90	67	74	26
Kei Road.	27·33	32·44	1877–1915	31·14	77	71	29
Keiskama Hoek..........	27·09	32·41	1886–1915	26·55	77	68	32
Kendrew (Holmes).......	24·30	32·30	1883–1915	12·23	38	68	32
Kenhardt...............	21·09	29·21	1878–1915	5·64	21	69	31
Kenilworth..............	18·28	33·59	1889–1915	47·09	105	20	80
Kentani.................	28·18	32·30	1889–1915	30·89	93	69	31
Kersefontein............	18·21	32·52	1892–1915	12·34	47	19	81
Kilrush..................	29·42	30·23	1899–1915	34·61	89	84	16
Kimberley (Gaol)........	24·46	28·44	1885–1915	16·25	46	78	22
Kimberley (Stephens)....	24·46	28·44	1882–1915	18·47	65	77	23
Kingwilliamstown (Gaol)..	27·23	32·52	1885–1915	22·41	79	67	33
Kingwilliamstown (Hospital).................	27·23	32·52	1868–1915	25·26	96	66	34
Klapmuts................	18·51	33·48	1883–1915	29·89	97	24	76
Kleinpoort..............	24·53	33·20	1880–1909	12·29	35	63	37
Klipdrift................	24·29	32·23	1882–1911	11·43	27	70	30
Klipfontein.	17·39	29·13	1885–1915	7·65	37	26	74
Klipfontein..............	24·56	32·29	1892–1915	11·63	36	65	35
Klipplaat................	24·20	33·03	1900–1915	9·84	30	65	35
Kluitjes Kraal...........	19·08	33·27	1893–1915	25·15	62	22	78
Knysna..................	23·03	34·03	1880–1915	28·27	97	49	51

(i) Mean Annual Rainfall—(*continued*).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
CAPE OF GOOD HOPE—(*continued*).							
Kokstad (Gaol)..........	29·26	30·33	1882–1915	27·18	83	80	20
Kokstad (The Willows)....	29·26	30·33	1905–1915	30·55	116	78	22
Kologha................	27·22	32·31	1885–1915	37·51	117	75	25
Komgha................	27·54	32·35	1884–1915	29·19	92	70	30
Kraaifontein............	17·44	29·15	1889–1915	5·55	28	25	75
Krom River............	23·02	31·59	1901–1915	8·73	35	66	34
Kruis River............	25·20	33·47	1901–1913	19·59	87	53	47
Kubusie................	27·29	32·35	1881–1915	24·71	69	72	28
Kuruman................	23·27	27·25	1904–1915	16·43	49	80	20
Ladismith..............	21·17	33·29	1878–1915	14·55	49	50	50
Lady Frere.............	27·13	31·42	1885–1915	24·22	64	78	22
Lady Grey..............	27·11	30·43	1888–1915	31·51	87	73	27
Laingsburg..............	20·54	33·12	1901–1915	4·62	26	52	48
Langebaan..............	18·02	33·05	1899–1915	12·46	63	21	79
Leeuwkuil..............	23·00	32·25	1883–1910	7·42	21	70	30
Lilyfontein..............	18·05	30·18	1885–1915	13·24	40	23	77
Lottering................	23·41	33·56	1896–1915	42·35	105	54	46
Lovedale................	26·51	32·46	1881–1915	23·36	85	66	34
Lower Nelspoort.........	23·07	32·12	1876–1905	9·95	36	68	32
Lyndene................	26·14	31·00	1898–1915	16·84	52	72	28
Lynedoch...............	25·59	32·31	1898–1915	16·81	50	62	38
MacGregor..............	19·49	33·57	1897–1915	9·68	41	31	69
Maclear.................	28·21	31·04	1891–1915	33·42	85	80	20
Mafeking................	25·39	25·52	1898–1915	21·51	58	84	16
Maitland................	18·30	33·54	1901–1915	24·56	82	22	78
Malmesbury.............	18·43	33·28	1878–1915	18·02	72	22	78
Matatiele...............	28·48	30·20	1892–1915	27·29	94	82	18
Matjesfontein............	20·36	33·14	1878–1915	6·88	27	37	63
Melrose.................	25·51	32·38	1900–1915	15·48	51	67	33
Middelburg..............	25·00	31·30	1878–1915	13·85	45	72	28
Middelcourt.............	27·00	31·00	1901–1912	18·80	60	76	24
Middelmount............	24·20	31·28	1893–1906	12·48	30	73	27
Middelpost..............	20·15	31·53	1882–1910	5·12	31	50	50
Middleton..............	25·49	32·57	1878–1915	14·22	43	63	37
Middlewater.............	25·32	33·05	1899–1915	11·68	36	57	43
Millwood................	22·59	33·53	1887–1915	41·64	120	58	42
Molteno.................	26·22	31·23	1889–1915	20·87	52	74	26
Montagu................	20·08	33·48	1883–1915	13·18	30	34	66
Montagu................	25·32	30·47	1902–1915	11·53	29	67	33
Mooifontein.............	26·16	31·07	1898–1915	18·33	46	71	29
Mossel Bay.............	22·09	34·11	1877–1915	17·31	90	47	53
Mount Ayliff............	29·22	30·49	1900–1910	27·20	101	73	27
Mount Coke.............	27·24	32·58	1899–1915	23·36	50	64	36
Mount Fletcher..........	28·30	30·42	1891–1915	27·58	71	80	20
M'qanduli...............	28·43	31·46	1890–1906	27·18	85	71	29
Murraysburg.............	23·48	31·57	1878–1915	11·02	39	65	35
Naauwpoort.............	24·57	31·11	1885–1915	14·47	43	70	30
Nelspoort...............	23·01	32·09	1886–1915	9·69	36	66	34
New Bethesda...........	24·34	31·52	1885–1915	14·20	38	72	28
Newlands...............	24·22	28·20	1885–1915	17·05	62	81	19
Newlands (Kelvin Grove)	18·28	33·58	1881–1896	52·20	78	20	80
Newlands (Montebello)...	18·28	33·58	1897–1913	66·07	110	23	77
New Year's Kraal.......	23·07	29·21	1901–1915	9·68	37	75	25
Omdraai's Vlei..........	23·09	30·06	1898–1908	9·54	19	63	37
O'okiep.................	17·52	29·36	1882–1915	6·99	43	25	75
Orange River...........	24·12	29·38	1884–1915	9·85	25	72	28
Oudtshoorn.............	22·13	33·35	1877–1915	9·21	36	46	54
Paarl....................	18·57	33·45	1878–1915	33·76	70	21	79
Palmietfontein...........	27·32	30·25	1898–1907	28·24	83	74	26
Patrysfontein............	24·42	31·53	1881–1915	14·78	42	72	28
Pearston................	25·07	32·34	1893–1910	13·80	43	65	35
Peddie..................	27·07	33·13	1878–1915	22·85	63	60	40
Pella....................	19·09	29·02	1878–1915	3·06	13	61	39
Perie (Forest)...........	27·18	32·45	1885–1915	37·79	98	72	28
Perie (Forestbourne).....	27·18	32·47	1881–1915	42·92	104	70	30
Petrusville..............	24·39	30·06	1893–1915	14·78	32	74	26
Philipstown.............	24·30	30·25	1878–1915	13·37	34	70	30
Pietermeintjes...........	20·30	33·15	1900–1915	13·82	29	27	73
Piquetberg..............	18·45	32·53	1879–1915	20·74	55	25	75
Plettenberg Bay.........	23·22	34·04	1891–1915	26·33	77	47	53
Poplar Grove............	26·43	32·08	1890–1915	18·68	41	75	25
Port Elizabeth..........	25·37	33·58	1866–1915	22·23	75	45	55
Porterville Road.........	19·01	33·18	1901–1915	22·05	47	23	77
Port Alfred.............	26·54	33·34	1889–1915	26·54	91	50	50
Port Nolloth............	16·51	29·14	1879–1913	2·17	17	21	79
Port St. Johns	29·35	31·38	1887–1915	48·56	106	68	32

(i) MEAN ANNUAL RAINFALL—(*continued*).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
CAPE OF GOOD HOPE—(*continued*).							
Prieska	22·45	29·59	1898–1915	9·75	29	70	30
Prince Albert	22·02	33·11	1877–1915	8·21	35	50	50
Prince Albert Road	21·41	32·58	1880–1913	4·57	17	60	40
Prospect Farm	27·48	32·37	1897–1915	29·84	93	70	30
Quacu Forest	27·29	32·34	1887–1915	29·74	106	76	24
Quaggas Kerk	26·13	32·19	1890–1906	20·85	63	64	36
Queenstown (Gaol)	26·52	31·54	1884–1915	21·45	62	76	24
Queenstown (Gardens)	26·52	31·54	1872–1915	23·00	84	76	24
Qumbu	28·52	31·10	1888–1915	29·93	98	78	22
Rawsonville	19·19	33·41	1900–1915	24·54	61	23	77
Rheboksfontein	21·36	31·24	1888–1911	5·46	15	66	34
Richmond	23·57	31·25	1878–1915	13·18	40	66	34
Rietbult	25·13	30·30	1877–1903	15·02	44	73	27
Rietfontein	23·49	32·59	1868–1915	9·43	28	66	34
Rietfontein	26·55	30·59	1898–1915	22·45	81	72	28
Riversdale	21·16	34·06	1877–1915	17·40	62	48	52
Robben Island	18·23	33·48	1891–1915	18·24	78	23	77
Robertson (Gaol)	19 53	33·47	1877–1915	12·57	53	38	62
Robertson (Plantation)	19·50	33·48	1898–1915	11·98	49	35	65
Roeklands	19·20	33·06	1885–1903	23·10	41	21	79
Rocklands	26·33	32·02	1893–1915	17·23	53	76	24
Rondebosch	18·29	33·58	1878–1902	42·15	111	22	78
Roodeberg	24·20	32·31	1878–1889	12·67	30	69	31
Roodebloem	24·36	32·09	1882–1915	11·40	36	68	32
Roodehoogte	24·56	31·44	1900–1915	13·77	35	71	29
Roosplaats	22·30	31·40	1898–1915	6·74	21	67	33
Roskeen	19·16	34·23	1904–1915	26·54	100	33	67
Salem	26·30	33·28	1878–1908	21·60	67	58	42
Saron	19·00	33·11	1877–1893	20·86	48	25	75
Schietfontein	24·19	32·46	1884–1895	11·28	50	70	30
Schuilhoek	24·47	30·58	1903–1915	13·19	49	72	28
Seteba	29·03	30·20	1900–1910	28·83	78	81	19
Setlagoli	25·08	26·16	1903–1915	18·36	46	83	17
Seymour	26·47	32·34	1878–1915	23·25	63	66	34
Sharks River (Convict Station)	25·37	33·59	1897–1909	25·89	89	45	55
Shark's River (Forest)	25·37	33·59	1895–1915	25·74	104	45	55
Simonstown (Gaol)	18·26	34·12	1869–1907	32·17	104	26	74
Simonstown (Wood)	18·26	34·12	1884–1910	31·84	119	28	72
Slaate	27·40	31·18	1892–1913	29·89	82	78	22
Somerset East	25·35	32·44	1878–1915	25·12	83	67	33
Somerset West	18·51	34·05	1877–1915	25·45	65	25	75
Somerville	28·37	31·12	1891–1913	28·00	111	76	24
Sourflats	23·00	33·57	1888–1915	34·68	115	56	44
Springbokfontein	17·53	29·40	1878–1915	8·99	34	23	77
Stellenbosch (Gaol)	18·51	33·56	1878–1915	28·04	77	24	76
Stellenbosch (Agricultural College)	18·51	33·56	1886–1898	26·55	93	22	78
Sterkspruit	27·19	30·31	1901–1915	25·46	70	76	24
Sterkstroom	26·33	31·33	1885–1915	19·00	56	74	26
Steynsburg	25·49	31·18	1878–1915	16·97	56	71	29
Steytlerville	24·19	33·20	1893–1915	9·25	30	67	33
Stonehills	25·38	32·02	1886–1904	15·70	49	73	27
Storm's River	23·52	33·58	1883–1915	44·40	128	53	47
Stutterheim (Bousfield)	27·27	32·34	1885–1915	29·67	130	73	27
Stutterheim (Wylde)	27·27	32·34	1883–1906	28·71	119	73	27
Sunnyside	26·30	33·17	1900–1915	23·87	86	63	37
Sutherland	20·42	32·25	1879–1915	9·40	40	38	62
Swellendam	20·27	34·04	1881–1915	32·64	88	52	48
Sydney's Hope	26·10	33·24	1893–1915	22·78	100	58	42
Tabankulu (Atkins)	29·19	30·58	1898–1910	28·17	89	72	28
Tabankulu (Residency)	29·19	30·58	1906–1915	31·95	101	72	28
Table Mountain—							
Dias Head	18·24	33·59	1881–1915	40·67	153	27	73
Kasteel's Poort	18·24	33·59	1884–1915	61·81	—	28	72
St. Michael's	18·25	33·58	1884–1915	74·75	—	28	72
Waai Kopje	18·25	33·58	1881–1915	65·72	—	28	72
Tafelberg	25·10	31·38	1885–1915	12·55	38	72	28
Tankatara	25·42	33·41	1879–1906	16·85	48	54	46
Tarkastad	26·15	32·00	1878–1915	18·46	70	71	29
Taungs	24·47	27·32	1898–1915	17·24	47	85	15
Thaba N'Doda	27·13	32·50	1887–1915	36·89	54	68	32
Theefontein	24·36	30·42	1906–1915	11·67	40	69	31
Thibet Park	26·27	32·10	1884–1915	19·43	65	73	27
Thomas River	27·18	32·28	1880–1915	20·92	65	74	26
Toegedacht	24·44	32·44	1894–1915	9·51	26	66	34

(i) MEAN ANNUAL RAINFALL—(*continued*).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
CAPE OF GOOD HOPE—(*continued*).							
Tokai	18·25	34·04	1886–1915	39·70	94	24	76
Touws River	20·03	33·20	1877–1909	8·95	34	32	68
Towers, The	18·28	33·25	1866–1915	18·24	66	21	79
Triangle	19·49	33·26	1900–1913	9·82	29	33	67
Trooilapspan	21·31	28·39	1899–1915	6·08	20	73	27
Tsomo	27·42	32·09	1890–1915	22·46	63	75	25
Tulbagh	19·08	33·18	1877–1915	18·53	53	25	75
Tylden	27·05	32·07	1882–1915	18·98	44	75	25
Uitenhage (Gaol)	25·25	33·46	1877–1915	17·35	60	54	46
Uitenhage (Inggs)	25·24	33·47	1898–1915	17·46	75	55	45
Uitenhage (Park)	25·25	33·46	1901–1915	18·25	76	52	48
Umtata	28·46	31·35	1881–1915	25·65	97	71	29
Umzimkulu	29·56	30·15	1885–1915	27·41	92	78	22
Uniondale	23·09	33·39	1878–1915	13·50	49	45	55
Upington	21·15	28·27	1883–1914	7·04	26	74	26
Van Rhyn's Dorp	18·46	31·35	1885–1915	5·71	37	20	80
Van Staadens	25·16	33·50	1881–1915	30·83	83	50	50
Van Wyk's Vlei	21·49	30·21	1882–1915	6·55	27	69	31
Varkens Kop	25·30	31·30	1898–1915	12·88	46	74	26
Varsch Vlei	25·45	31·40	1883–1901	13·69	45	72	28
Venterstad	25·47	30·47	1883–1915	18·29	61	70	30
Victoria West	23·07	31·24	1878–1915	10·14	38	66	34
Vogel Vlei	21·49	34·13	1900–1915	17·40	40	50	50
Vosburg	22·53	30·35	1903–1915	9·01	28	64	36
Vruchtbaar	19·00	33·40	1904–1915	28·71	76	26	74
Vryburg	24·44	26·57	1886–1915	19·69	53	84	16
Wagenaar's Kraal	22·48	31·48	1885–1906	9·92	40	74	26
Walsingham	25·10	32·28	1883–1915	14·38	46	64	36
Wanstead	29·01	30·18	1904–1915	32·85	76	81	19
Waverley	26·28	31·56	1884–1915	18·89	54	75	25
Welbedacht	19·13	32·10	1898–1915	9·22	30	16	84
Wellington (Gaol)	18·59	33·38	1881–1915	26·50	76	23	77
Wellington (Seminary)	18·59	33·38	1876–1908	25·57	84	22	78
Wellwood	24·38	31·59	1875–1915	13·27	50	68	32
Whittlesea	26·49	32·10	1881–1915	17·96	54	74	26
Wildeheestkooi	23·42	30·12	1882–1914	9·22	23	66	34
Willowmore	23·30	33·17	1878–1915	9·28	38	62	38
Willows, The	24·39	31·33	1886–1915	14·06	39	72	28
Winterhoek	24·28	32·15	1881–1915	17·21	48	66	34
Witte Els Bosch	24·09	34·00	1892–1915	44·99	106	52	48
Witteklip	25·14	33·55	1881–1910	29·85	48	51	49
Witmoss	25·45	32·33	1884–1915	14·85	33	70	30
Wolfridge	27·05	32·39	1899–1915	42·81	101	70	30
Woodcliff	28·10	31·00	1891–1915	40·69	93	81	19
Worcester (Gaol)	19·26	33·39	1869–1915	12·67	42	26	74
Worcester (Meiring)	19·26	33·39	1881–1905	11·84	45	27	73
Wupperthal	19·11	32·14	1890–1915	10·59	35	20	80
Wynberg (St. Alban's)	18·28	34·00	1876–1900	42·23	95	20	80
Wynberg (St. Mary's)	18·28	34·00	1897–1915	47·10	103	22	78
Zwartberg Pass	22·03	33·21	1887–1915	28·79	50	54	46
Zwavelfontein	22·39	30·54	1903–1915	8·01	31	63	37
NATAL.							
Cedara Vlei	30·16	29·31	1902–1915	32·39	120	81	19
Dundee	30·18	28·11	1896–1915	31·26	67	83	17
Durban (Observatory)	31·00	29·51	1871–1915	40·91	118	71	29
Durban (Point)	31·03	29·52	1897–1915	41·87	110	71	29
Estcourt	29·53	29·00	1894–1915	28·06	72	86	14
Greytown	30·38	29·04	1894–1915	36·45	106	83	17
Howick	30·14	29·27	1896–1915	23·04	117	81	19
Killarney	30·34	29·48	1903–1915	27·02	90	76	24
Klootend	30·32	30·34	1904–1915	37·95	118	71	29
Ladysmith	29·47	28·33	1896–1915	27·31	84	84	16
Mid Illovo	30·35	30·01	1904–1915	40·91	133	74	26
Newcastle	29·56	27·45	1894–1915	36·80	67	87	13
New Hanover	30·30	29·22	1896–1915	37·28	108	79	21
Pietermaritzburg	30·22	29·35	1895–1915	35·97	127	82	18
Port Shepstone	30·27	30·43	1892–1915	43·67	103	68	32
Richmond	30·17	29·51	1894–1915	42·63	126	78	22
Stanger	31·17	29·19	1893–1915	42·31	104	74	26
Umzinto	30·41	30·26	1892–1915	42·55	84	72	28

(i) MEAN ANNUAL RAINFALL (*continued*).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
NATAL—(*continued*).							
Verulam	31·04	29·37	1892–1915	38·03	98	73	27
Vryheid	30·43	27·51	1906–1915	36·89	89	83	17
Weenen	30·05	28·51	1896–1915	26·31	73	83	17
Winklespruit	30·50	30·03	1903–1915	43·35	108	70	30
ZULULAND—							
Hlabisa	31·52	28·08	1899–1915	43·22	80	78	22
Mahlabatini	31·28	28·15	1902–1915	31·68	76	81	19
Melmoth	31·23	28·35	1899–1915	30·88	124	79	21
Mongoma	31·36	27·53	1899–1915	32·20	75	80	20
Ubombo	32·04	27·32	1899–1915	37·81	87	80	20
TRANSVAAL.							
BARBERTON—							
Alkmaar	30·50	25·27	1906–1915	36·44	72	86	14
Barberton	31·04	25·45	1888–1915	31·98	101	84	16
Cairn	30·54	25·27	1905-1915	37·93	100	87	13
Crocodile Poort	31·09	25·29	1905–1915	26·94	52	86	14
Elandshoek	30·42	25·30	1905–1915	40·33	69	85	15
Eureka	31·10	25·40	1905–1915	27·05	46	87	13
Godwan River	30·38	25·35	1905–1915	32·57	64	88	12
Hectorspruit	31·39	25·25	1905–1915	28·34	68	86	14
Hilltop	31·03	25·35	1903–1915	38·33	101	87	13
Kaapmuiden	31·21	25·32	1905–1915	26·17	55	86	14
Kaapsche Hoop	30·46	25·35	1892–1915	54·99	110	87	13
Komatipoort	31·56	25·26	1904–1915	26·27	71	86	14
Legogat	31·00	25·28	1903–1915	40·59	85	87	13
Malalane	31·30	25·30	1903–1915	26·03	78	85	15
Nelspruit	30·59	25·28	1905-1915	37·69	62	90	10
BETHAL—							
Bekker's Rust	29·36	26·33	1905-1915	29·55	67	90	10
Bethal	29·28	26·27	1903–1915	30·39	89	90	10
Vlakkuilen	29·28	26·15	1905-1915	27·46	57	88	12
Vlaklaagte	29·29	26·23	1906·1915	29·96	73	82	18
BLOEMHOF—							
Bloemhof	25·36	27·39	1903–1915	18·82	68	82	18
Christiana	25·10	27·55	1904–1915	16·95	50	82	18
Poortje	25·26	26·54	1903–1915	19·06	47	86	14
Schweizer Reneke	25·20	27·11	1904–1915	17·83	50	83	17
Vecht Vallei	25·04	27·25	1903–1915	17·48	59	82	18
CAROLINA—							
Airlie	30·31	25·37	1905–1915	28·05	58	89	11
Brakspruit	30·09	25·27	1905–1915	29·61	76	87	13
Carolina	30·07	26·04	1904–1915	28·93	87	87	13
Dalmanutha	30·10	25·45	1905–1915	32·92	88	87	13
Waterval Boven	30·19	25·39	1903-1915	31·21	85	87	13
ERMELO.							
Amsterdam	30·39	26·38	1904–1915	35·22	80	87	13
Athole	30·33	26·36	1904–1915	39·29	90	87	13
Bellevue	30·20	26·15	1903–1915	30·75	81	88	12
Camden	30·10	26·38	1905–1915	31·53	85	88	12
De Emigratie	30·07	26·46	1905–1915	28·37	73	88	12
Ermelo	29·59	26·31	1895–1915	29·21	78	89	11
Goodehoop	29·56	26·44	1905–1915	29·17	71	89	11
Kranspan	30·11	26·27	1905–1915	31·75	71	89	11
Remhoogte	29·43	26·29	1905–1915	27·89	80	90	10
Uitzicht	29·47	26·38	1906–1915	29·76	57	89	11
Vleiplaats	29·45	26·41	1903–1915	30·29	71	89	11
HEIDELBERG.							
Greylingstad	28·44	26·44	1905–1915	30·51	74	87	13
Heidelberg	28·22	26·30	1903–1915	27·73	87	88	12
Rietvlei	28·18	26·23	1905–1915	27·76	71	88	12
Vereeniging	27·56	26·40	1901–1915	27·37	89	87	13
Vlakfontein	28·26	26·44	1905–1915	28·71	83	86	14
Withoek	28·20	26·19	1903–1915	26·80	75	87	13

(*i*) MEAN ANNUAL RAINFALL—(*continued*).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
TRANSVAAL—(*continued*).							
LICHTENBURG.							
Doornbult	26·10	26·33	1904–1915	20·83	40	82	18
Lichtenburg	26·10	26·10	1903–1915	23·74	78	87	13
Palmietfontein	26·17	26·33	1905–1915	21·63	35	86	14
LYDENBURG.							
Belfast (Forest)	30·02	25·41	1905–1915	32·00	87	87	13
Belfast (St.)	30·03	25·43	1904–1915	32·20	78	88	12
Bushbuck Ridge	31·03	24·48	1905–1915	44·93	102	86	14
Dullstroom	30·06	25·25	1906–1915	30·48	83	83	17
Graksop (Forest)	30·50	24·56	1906–1915	68·65	135	84	16
Lydenburg	30·27	25·06	1904–1915	25·13	65	89	11
Machadodorp	30·14	25·40	1903–1915	32·16	102	88	12
Nooitgedacht	30·26	25·03	1903–1915	25·77	59	90	10
Pilgrim's Rest	30·44	24·54	1885–1915	40·48	138	86	14
Sabie	30·47	25·05	1898–1915	44·58	116	86	14
Waterval Onder	30·23	25·39	1904–1915	27·38	52	88	12
MARICO.							
Rietfontein	26·09	25·24	1904–1915	19·39	46	88	12
Riekersdam	26·23	25·27	1904–1915	25·83	75	90	10
Vaalkop	26·13	25·35	1904–1915	24·90	68	89	11
Zeerust (Harmonia)	26·05	25·32	1903–1915	24·05	82	87	13
Zeerust (Town)	26·05	25·32	1903–1915	23·58	82	87	13
MIDDELBURG.							
Brugspruit	29·08	25·53	1905–1915	27·15	66	87	13
Gemboksfontein	29·41	25·44	1903–1915	29·24	103	87	13
Goedehoop	29·29	25·34	1903–1915	28·96	68	89	11
Keerom	29·31	25·41	1903–1915	27·43	80	87	13
Middelburg	29·28	25·46	1903–1915	28·77	100	90	10
Pamplaats	29·46	25·41	1903–1915	27·82	71	89	11
Roosenekal	29·55	25·12	1906–1915	29·24	60	88	12
Schoonoord	29·46	26·00	1903–1915	27·23	91	89	11
Tautesberg	29·47	25·17	1905–1915	20·33	75	88	12
Vaalkranz	29·20	26·07	1904–1915	27·63	76	89	11
Witbank	29·12	25·53	1904–1915	29·64	89	89	11
Zwartfontein	29·10	25·45	1906–1915	27·75	82	87	13
PIET RETIEF.							
Bergplaats	31·14	27·15	1904–1915	30·58	90	83	17
Cascades	30·44	26·47	1904–1915	34·98	58	82	18
Piet Retief	40·48	27·00	1904–1915	30·62	88	86	14
POTCHEFSTROOM.							
Bank	27·31	26·19	1903–1915	22·90	51	88	12
Boskop	27·08	26·33	1905–1915	24·55	71	85	15
Elandsheuvel	27·06	26·42	1904–1915	24·91	60	85	15
Gerhard Minnebron	27·09	26·29	1905–1915	23·64	51	86	14
Haaskraal	27·03	26·50	1904–1915	25·07	80	86	14
Klerksdorp	26·40	26·52	1895–1915	21·89	70	84	16
Klerkskraal	27·10	26·14	1903–1915	25·50	75	88	12
Koppies Kraal	27·22	26·53	1903–1915	25·59	49	86	14
Machavie	26·58	26·47	1904–1915	23·20	69	85	15
Mooibank	27·07	26·41	1904–1915	22·99	80	85	15
Potchefstroom (Exp. Farm)	27·05	26·44	1903–1915	23·69	76	85	15
Potchefstroom (Town)	27·05	26·43	1903–1915	25·20	76	85	15
Roodekop	26·54	26·27	1904–1915	24·24	64	86	14
Strathmore	26·37	26·50	1903–1915	22·91	79	84	16
Turffontein	27·09	26·25	1903–1915	24·46	49	89	11
PRETORIA.							
Bronkhorstspruit	28·44	25·48	1905–1915	27·99	73	90	10
Donkerhoek	28·27	25·47	1904–1915	28·09	57	89	11
Irene	28·13	25·53	1903–1915	27·84	87	89	11
Kaalfontein	28·15	26·02	1903–1915	30·93	85	88	12
Modderfontein	28·09	26·06	1903–1915	29·29	97	86	14
Premier Mine	28·30	25·40	1904–1915	28·31	70	89	11
Pretoria (Arcadia)	28·12	25·45	1902–1915	29·68	92	90	10
Pretoria (Fountains)	28·12	25·47	1904–1915	32·18	84	90	10
Pretoria (Gezina)	28·13	25·43	1903–1915	27·69	55	91	9
Pretoria (Leper Asylum)	28·07	25·44	1904–1915	27·57	73	90	10
Pretoria (Municipal)	28·11	25·44	1904–1915	29·80	65	91	9
Old Govt. Bldgs	28·11	25·45	1891–1913	26·39	84	89	11
Pretoria (West)	28·11	25·45	1905–1915	31·11	77	90	10
Pyramids	28·08	25·35	1902–1915	24·99	58	90	10
Waaikraal	28·41	25·39	1904–1915	26·82	72	88	12
Zuurfontein	28·14	26·07	1904–1915	27·41	72	87	13
Zwartspruit	28·01	25·43	1905–1915	25·52	52	90	10

(i) Mean Annual Rainfall—(*continued*).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
Transvaal—(*continued*).							
Rustenburg.							
Commissie Drift	27·13	25·47	1905–1915	29·01	73	89	11
Cyferbult	27·19	26·00	1905–1915	26·48	54	87	13
Rustenburg	27·14	25·40	1903–1915	25·86	75	89	11
Vlakfontein	27·03	25·54	1905–1915	24·50	76	87	13
Wolhuter's Kop	27·42	25·42	1905–1915	29·16	77	89	11
Zandfontein	27·14	25·58	1905–1915	27·55	86	88	12
Standerton.							
Beginsel	29·15	26·57	1905–1915	29·77	78	87	13
Cranbourne	29·29	27·10	1904–1915	30·27	87	87	13
Earlridge	29·27	27·07	1903–1915	27·57	80	87	13
New Denmark	29·16	26·42	1905–1915	27·44	84	87	13
Platrand	29·28	27·05	1903–1915	28·11	71	88	12
Standerton	29·15	26·57	1903–1915	30·26	79	88	12
Val	28·56	26·48	1905–1915	28·23	56	88	12
Wakkerstroom.							
Amersfoort	29·53	27·00	1906–1915	29·62	68	87	13
Balmoral	30·13	26·53	1905–1915	38·77	73	86	14
Rietpoort	29·49	27·08	1906–1915	33·04	83	88	12
Rolfontein	29·56	26·59	1904–1915	29·95	61	90	10
Wakkerstroom	30·08	27·21	1904–1915	32·09	92	86	14
Volksrust	29·53	27·22	1903–1915	33·47	100	88	12
Zandspruit	29·47	27·16	1905–1915	28·48	57	89	11
Zomershoek	30·02	27·10	1905–1915	28·26	61	85	15
Waterberg.							
Brakfontein	28·07	24·04	1904–1915	25·22	65	89	11
Doorndraai	28·47	24·17	1905–1915	21·96	59	88	12
Geelhoutkop	28·23	24·17	1904–1915	25·80	63	90	10
Gembokspoort	28·12	24·42	1904–1915	26·42	63	88	12
Groenfontein	28·29	24·37	1903–1915	21·49	43	87	13
Naboomspruit	28·43	24·31	1904–1915	23·11	48	90	10
Num Num	28·37	24·42	1904–1915	23·31	72	90	10
Potgietersrust	29·01	24·11	1903–1915	24·59	63	91	9
Rhenosterpoort	28·09	24·38	1904–1915	23·74	63	88	12
Twenty-four Rivers	28·17	24·15	1904–1915	23·21	75	89	11
Warmbaths	28·17	24·53	1904–1915	23·42	61	88	12
Zandrivierpoort	28·07	24·25	1904–1915	25·36	65	88	12
Witwatersrand.							
Bedford Farm	28·07	26·10	1904–1915	28·37	83	87	13
East Rand Prop. Mines	28·14	26·13	1904–1915	29·12	83	88	12
Florida	27·54	26·09	1903–1915	30·98	92	88	12
Germiston (New Primrose G.M. Co.)	28·11	26·12	1904–1915	28·74	87	88	12
Hekpoort	27·36	25·54	1905–1915	26·35	64	88	12
Johannesburg—							
Belgravia	28·04	26·12	1904–1915	34·66	83	87	13
Berea Water Works	28·03	26·11	1904–1915	32·94	93	88	12
Booysens	28·00	26·13	1904–1915	29·51	92	87	13
Cemetery	28·02	26·11	1903–1915	31·40	95	88	12
City and Sub. G.M. Co.	28·03	26·12	1904–1915	30·93	85	88	12
Hospital Hill	28·03	26·11	1904–1915	30·74	87	88	12
Joubert Park	28·03	26·11	1888–1915	31·96	88	86	14
Oakdene	28·03	26·15	1905–1915	30·40	68	86	14
Observatory	28·04	26·11	1904–1915	29·03	93	87	13
Observatory (Valley)	28·04	26·11	1904–1915	32·48	99	87	13
Turffontein	28·01	26·14	1904–1915	30·46	96	86	14
Wolhuter G.M. Co.	28·04	26·12	1905–1915	31·60	94	87	13
Kleinfontein	28·19	26·11	1904–1915	27·37	73	88	12
Knight's G.M. Co.	28·11	26·12	1904–1915	28·98	72	87	13
Krugersdorp	27·46	26·06	1903–1915	30·43	84	88	12
Langlaagte	27·59	26·12	1903–1915	30·88	86	88	12
Luipaard's Vlei	27·47	26·07	1904–1915	28·57	82	89	11
Maraisburg	27·57	26·10	1903–1915	27·53	80	88	12
Natal Spruit	28·09	26·18	1904–1915	30·97	92	88	12
Randfontein	27·42	26·10	1904–1915	26·87	79	87	13
Simmer and Jack G. M. Co.	28·08	26·12	1904–1915	30·93	80	87	13
Steenkopjes	27·35	26·01	1906–1915	26·71	85	89	11
Zuurbekom	27·47	26·19	1903–1915	27·59	90	88	12

(1) MEAN ANNUAL RAINFALL—(*continued*).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
TRANSVAAL—(*continued*).							
WOLMARANSSTAD.							
Mimosa Vale	26·05	27·36	1906–1915	21·35	56	84	16
Uitkyk	25·50	27·28	1903–1915	19·16	44	84	16
Wondilla	26·02	27·36	1904–1915	20·12	62	82	18
ZOUTPANSBERG.							
Blaauwberg	28·59	23·04	1904–1915	28·61	49	91	9
Dwars River	29·45	23·26	1904–1915	19·23	44	91	9
Eerstling	29·16	24·08	1905–1915	27·34	60	91	9
Elim	30·03	23·19	1903–1915	34·82	94	88	12
Groot Spelonken	30·00	23·28	1904–1915	38·79	81	87	13
Haenertsburg	29·56	23·56	1903–1915	40·66	102	86	14
Krabbefontein	30·07	23·48	1903–1915	49·46	98	89	11
Louis Trichardt	29·54	23·03	1905–1915	32·38	99	86	14
Mamathola	30·11	23·57	1904–1915	52·35	110	89	11
Moddervlei	30·00	23·12	1904–1915	35·37	78	88	12
Mow Cop	29·57	23·01	1906–1915	31·43	59	86	14
Pienar's Nek	29·20	24·18	1904–1915	23·65	56	91	9
Pietersburg (Hospital)	29·28	23·54	1904–1915	20·09	55	90	10
Pietersburg (Post Office)	29·28	23·54	1903–1915	21·69	61	90	10
Sibasa	30·25	22·55	1904–1915	58·41	67	88	12
Stonehenge	29·54	23·02	1904–1915	34·00	76	87	13
Thabina	30·17	23·58	1905–1915	34·26	41	90	10
Wilgeboschfontein	29·54	23·34	1904–1915	26·65	77	90	10
Woodbush (Forest)	29·59	23·51	1904–1915	71·97	138	88	12
ORANGE FREE STATE.							
Alma	27·27	28·54	1904–1915	26·25	56	79	21
Bellevue	28·30	28·13	1906–1915	29·79	81	81	19
Bethlehem	28·18	28·14	1903–1915	24·51	68	82	18
Bethulie	25·58	30·30	1886–1915	18·46	55	76	24
Bloemfontein	26·12	29·07	1880–1915	22·05	62	76	24
Boomplaats	25·39	29·51	1906–1915	14·21	27	75	25
Boshof	25·14	28·32	1879–1908	19·87	57	77	23
Bucklands Downs	29·08	27·58	1906–1915	30·97	84	86	14
Burgundy	27·11	29·14	1906–1915	25·73	78	76	24
Burnet Holme	27·10	28·01	1905–1915	21·55	56	81	19
Carrisbrooke	27·11	27·47	1904–1915	23·25	55	83	17
Clearwater	27·18	30·06	1905–1915	26·29	79	76	24
Cliff, The	26·46	29·29	1905–1915	22·56	57	75	25
Congleton	27·20	27·36	1906–1915	24·36	73	82	18
Devon Farm	26·35	29·35	1906–1915	19·99	60	74	26
Dewetsdorp	26·40	29·35	1906–1915	23·33	56	75	25
Dunelm	28·22	28·37	1905–1915	33·25	99	81	19
Ellerslie North	26·16	29·34	1905–1915	20·59	66	76	24
Excelsior	25·42	30·23	1905–1915	14·20	52	74	26
Fairfield	27·55	28·27	1904–1915	26·97	72	81	19
Fauresmith	25·19	29·45	1898–1915	14·84	39	72	28
Fort Bassett	27·00	29·16	1905–1915	28·92	69	76	24
Glenyon	26·17	28·58	1895–1915	19·59	46	77	23
Groothoek	26·52	29·17	1905–1915	21·64	61	75	25
Harrismith	29·07	28·16	1882–1912	26·97	69	81	19
Harrismith (Forest)	29·10	28·16	1905–1915	28·19	76	84	16
Helvetia	26·33	29·52	1905–1915	19·21	53	76	24
Imperani	27·52	28·51	1904–1915	28·18	75	82	18
Jacobsdal	24·48	29·09	1885–1915	17·46	46	74	26
Jagersfontein	25·26	29·46	1890–1915	18·28	40	75	25
Kalkfontein	26·41	29·45	1906–1915	20·86	53	76	24
Kalkoenkrantz	27·56	28·32	1905–1915	31·03	81	81	19
Koffiefontein	25·00	29·24	1905–1915	13·75	41	72	28
Kroonbank	27·48	27·37	1905–1915	25·96	87	83	17
Kroonstad	27·14	27·40	1879–1915	24·32	68	80	20
Ladybrand (Nursery)	27·26	29·10	1905–1915	27·34	73	77	23
Ladybrand (School)	27·27	29·12	1879–1915	30·65	88	76	24
Leeuw River Mills	27·12	29·15	1902–1915	23·57	55	75	25
Lindley	27·55	27·53	1897–1915	24·25	65	80	20
Maccauwlei	27·57	26·41	1905–1915	26·66	74	86	14
Mazel's Poort	26·24	29·03	1905–1915	20·10	66	78	22
Middelpunt	28·03	28·11	1906–1915	26·28	70	82	18
Modderpoort	27·27	29·06	1904–1915	27·34	83	78	22
Mount Stephen	27·02	29·04	1905–1915	25·07	74	78	22
New Vale	27·24	29·15	1905–1915	26·24	61	77	23
Niet te Weet	25·19	30·26	1905–1915	15·44	43	75	25

(I) Mean Annual Rainfall—(*continued*).

Stations.	Longitude E.	Latitude S.	Period.	Mean Annual Rainfall.	Mean Annual Number of Days.	Percentage of Summer Rainfall.	Percentage of Winter Rainfall.
Orange Free State—(*continued*).							
Nieuwjaarsfontein	26·38	29·31	1905–1915	21·43	57	76	24
Normandale	25·47	30·12	1905–1915	17·56	55	72	28
Novo	28·15	27·42	1906–1915	27·12	70	84	16
Oranje	25·31	30·20	1906–1915	16·62	37	74	26
Parys	27·27	26·54	1904–1915	25·53	78	83	17
Philippolis	25·16	30·16	1879–1915	18·07	48	72	28
Ramalitsi	26·38	29·12	1906–1915	23·89	55	77	23
Reddersburg	26·10	29·39	1906–1915	19·58	69	76	24
Reitz	28·26	27·48	1904–1915	26·80	89	81	19
Riversdale	26·26	30·33	1906–1915	16·23	37	75	25
Riversford	26·07	29·27	1906–1915	17·89	50	76	24
Rouxville	26·50	30·25	1906–1915	22·60	64	74	26
Sannah's Post	26·33	29·12	1905–1915	16·39	45	77	23
Senekal	27·37	28·19	1905–1915	24·72	74	83	17
Smithfield	26·32	30·13	1882–1915	20·13	46	75	25
Springfontein	25·42	30·16	1906–1915	17·72	46	71	29
Stoltzkop	28·35	27·39	1906–1915	28·91	75	86	14
Thaba 'Nchu	26·51	29·13	1898–1915	24·41	58	77	23
Tweespruit	27·05	29·12	1905–1915	25·13	74	77	23
Vrede	29·10	27·26	1905–1915	27·62	63	87	13
Vryheid	28·18	27·21	1905–1915	25·43	82	87	13
Wepener	27·02	29·44	1890–1915	27·96	69	79	21
Westminster	27·09	29·10	1906–1915	24·61	73	77	23
Whinburn	28·16	28·15	1904–1915	29·09	90	81	19
Wilgeboom Nek	26·55	29·14	1903–1915	22·29	59	78	22
Winburg	27·01	28·31	1886–1915	21·92	58	81	19
Wonderboom	27·03	29·49	1906–1915	23·17	47	74	26
York	26·58	29·18	1907–1915	22·92	68	75	25
Zuikerkop	27·36	29·00	1905–1915	25·95	75	79	21
BASUTOLAND.							
Butha Buthe	28·13	28·44	1891–1901	32·29	87	79	21
Leribe	28·10	28·49	1887–1915	34·58	89	79	21
Mafeteng	27·13	29·47	1886–1910	31·69	78	75	25
Masern	27·30	29·17	1885–1911	30·40	86	76	24
Mohalies Hoek	27·28	30·08	1896–1915	29·04	69	75	25
Moyeni	27·45	30·23	1887–1911	35·49	84	74	26
Qachas Nek	27·48	30·19	1895–1915	36·10	100	82	18
Teyateyaneng	27·45	29·08	1896–1915	29·87	80	78	22
SWAZILAND.							
Bremersdorp	31·23	26·29	1897–1915	37·32	85	84	16
Croydon	31·37	26·15	1905–1915	32·37	89	84	16
Forbes Reef	31·06	26·09	1906–1915	46·30	118	83	17
Hlatikulu	31·20	26·58	1905–1915	44·84	119	83	17
Mbabane	31·09	26·19	1903–1915	50·18	130	85	15
Pigg's Peak	31·15	25·58	1903–1915	50·44	120	85	15
Schroedershof	31·58	26·28	1899–1915	34·00	105	81	19

Table (ii).

YEARLY RECORDS OF RAINFALL IN NINE TOWNS FROM EARLIEST DATE OF OBSERVATION IN EACH CASE.

(*a*) RAINFALL RECORDED AT CAPETOWN (ROYAL OBSERVATORY), 1838–1866)

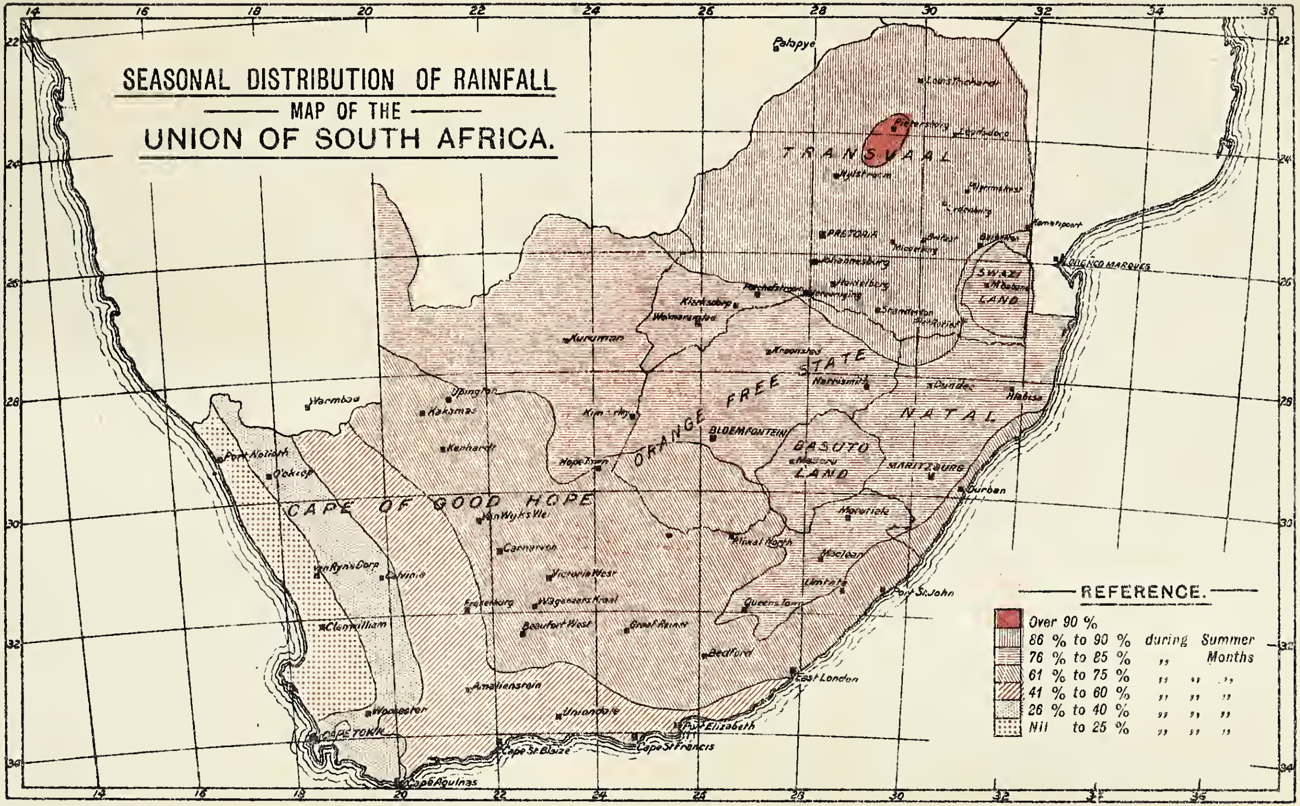
Year.	Amount.	Year.	Amount.	Year.	Amount.	Year.	Amount.	Year.	Amount.
	Inches.		Inches.		Inches.		Inches.		Inches.
1838	24·44	1844	18·78	1850	33·47	1856	19·48	1862	32·01
1839	17·48	1845	20·91	1851	20·30	1857	22·04	1863	25·60
1840	25·06	1846	22·50	1852	23·19	1858	24·27	1864	18·92
1841	23·21	1847	22·38	1853	21·22	1859	36·72	1865	18·67
1842	26·27	1848	23·25	1854	20·05	1860	29·12	1866	19·21
1843	24·82	1849	24·62	1855	24·57	1861	25·44	—	—

(*b*) RAINFALL IN NINE TOWNS, 1867–1921.

Year.	Capetown (Royal Observatory).	Port Elizabeth.	Durban.	Willowmore.	Graaff-Reinet.	Bloemfontein.	Prieska.	Kimberley.	Johannesburg (Joubert Park).
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1867..........	22·96	33·59	—	—	—	—	—	—	—
1868..........	19·95	19·78	—	—	—	—	—	—	—
1869..........	32·34	22·93	—	—	—	—	—	—	—
1870..........	28·06	30·38	—	—	—	—	—	—	—
1871..........	20·11	24·24	—	—	—	—	—	—	—
1872..........	29·33	28·60	—	—	—	—	—	—	—
1873..........	23·77	20·15	43·90	—	—	—	—	—	—
1874..........	26·20	30·33	53·17	—	—	—	—	—	—
1875..........	25·71	23·40	54·68	—	—	—	—	—	—
1876..........	26·64	22·17	35·22	—	—	—	—	—	—
1877..........	35·56	15·31	35·54	—	—	—	—	—	—
1878..........	41·02	24·83	28·64	8·76	—	—	7·46	—	—
1879..........	18·74	20·73	44·14	8·29	—	—	9·54	—	—
1880..........	17·71	25·99	47·58	5·61	—	—	6·67	—	—
1881..........	25·61	22·52	37·07	6·08	14·50	34·71	18·09	—	—
1882..........	29·31	17·27	36·21	12·61	12·30	19·42	8·05	13·33	—
1883..........	32·06	23·17	44·52	4·58	10·00	16·04	3·62	11·76	—
1884..........	28·29	19·70	44·68	7·35	9·60	16·44	11·24	17·71	—
1885..........	27·92	17·14	34·48	8·78	14·72	17·84	4·46	8·25	—
1886..........	27·79	22·56	31·79	9·27	21·46	17·66	6·39	13·07	—
1887..........	23·08	16·22	31·87	6·96	15·86	21·45	11·52	17·33	—
1888..........	36·06	28·39	38·21	16·26	14·47	27·88	9·70	16·25	—
1889..........	30·98	25·02	29·27	9·23	18·53	33·05	11·12	15·97	19·85
1890..........	26·34	15·28	32·78	11·09	17·21	28·89	13·15	21·00	25·94
1891..........	30·30	24·82	45·45	14·67	20·61	34·57	15·98	30·17	40·85
1892..........	40·92	19·16	38·20	8·99	15·91	25·79	14·54	7·90	27·54
1893..........	23·42	22·29	71·32	13·58	15·32	15·98	13·66	14·52	37·63
1894..........	22·55	16·22	37·27	11·46	14·83	25·12	12·68	25·21	35·41
1895..........	28·52	17·05	51·41	7·53	12·35	33·03	11·64	15·76	29·14
1896..........	17·07	16·97	39·60	11·23	13·87	19·60	4·87	18·54	23·23
1897..........	19·92	26·23	34·39	7·96	12·21	15·17	4·63	10·54	28·98
1898..........	28·78	22·35	42·48	9·70	13·51	23·72	10·78	16·94	28·99
1899..........	26·79	10·41	27·86	6·72	9·10	18·10	13·48	18·00	28·57
1900..........	21·24	17·42	27·24	11·97	16·41	—	7·55	16·38	32·80
1901..........	25·66	20·38	55·54	7·48	15·15	—	12·02	21·67	35·48
1902..........	35·74	20·09	41·28	10·96	15·11	—	3·53	18·78	33·51
1903..........	29·92	25·93	35·66	4·11	7·84	14·37	1·37	10·80	27·23
1904..........	31·82	21·95	34·72	9·61	12·14	21·09	11·87	15·90	36·60
1905..........	30·15	24·20	44·95	10·23	12·94	22·28	8·38	12·15	27·57
1906..........	20·26	29·15	41·58	9·39	17·93	19·51	6·09	20·05	32·22
1907..........	19·89	21·40	38·78	10·42	12·17	26·62	18·71	25·59	37·35
1908..........	24·72	25·65	44·91	3·98	7·12	14·41	6·92	13·67	26·66
1909..........	24·01	22·06	44·37	9·84	18·49	28·46	17·03	19·40	52·57
1910..........	21·56	25·34	47·93	—	13·02	18·38	3·80	14·65	33·29
1911..........	27·42	28·82	42·32	—	17·63	22·27	14·81	10·70	29·50
1912..........	22·00	22·30	29·91	—	8·65	14·38	8·49	12·85	26·37
1913..........	24·01	23·09	45·89	—	17·64	14·97	11·41	14·15	30·18
1914..........	25·02	20·63	36·33	—	12·40	21·79	8·06	16·44	32·10
1915..........	26·00	22·96	37·01	—	8·55	22·65	8·11	12·31	44·46
1916..........	21·20	26·54	29·55	—	12·95	15·49	5·53	9·74	32·91
1917..........	25·31	34·08	79·79	—	19·53	21·59	10·89	15·56	54·88
1918..........	22·38	25·64	41·63	—	11·26	24·18	11·43	18·29	52·41
1919..........	19·59	20·26	37·28	—	6·53	11·64	4·45	8·90	26·03
1920..........	26·98	13·57	44·51	—	17·92	23·20	11·12	21·44	30·50
1921..........	25·83	25·46	54·08	—	19·95	21·85	10·71	14·43	40·24
Average.......	25·36*	22·58	41·37	9·62	14·09	21·73	9·67	15·90	33·36
Highest........	41·02	34·08	79·79	16·92	21·46	34·71	18·71	30·17	54.88
Lowest........	17·07	10·41	27·24	3·98	6·53	11·64	1·37	7·90	19·85
Ratio of Difference to Mean Rainfall..........	·94	1·05	1·27	1·34	1·06	1·06	1·79	1·40	1·05

* For period 1838 to 1921.

Map I



SEASONAL DISTRIBUTION OF RAINFALL
MAP OF THE
UNION OF SOUTH AFRICA.

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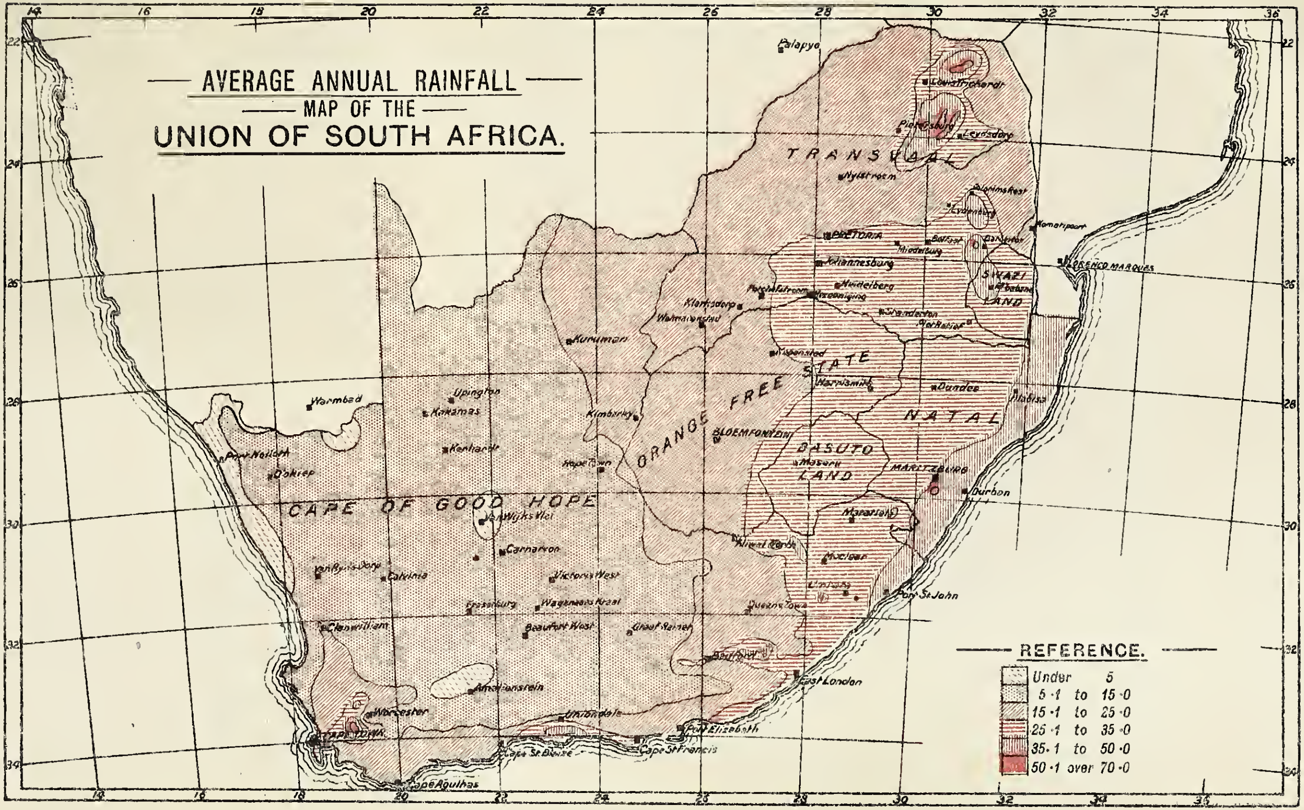
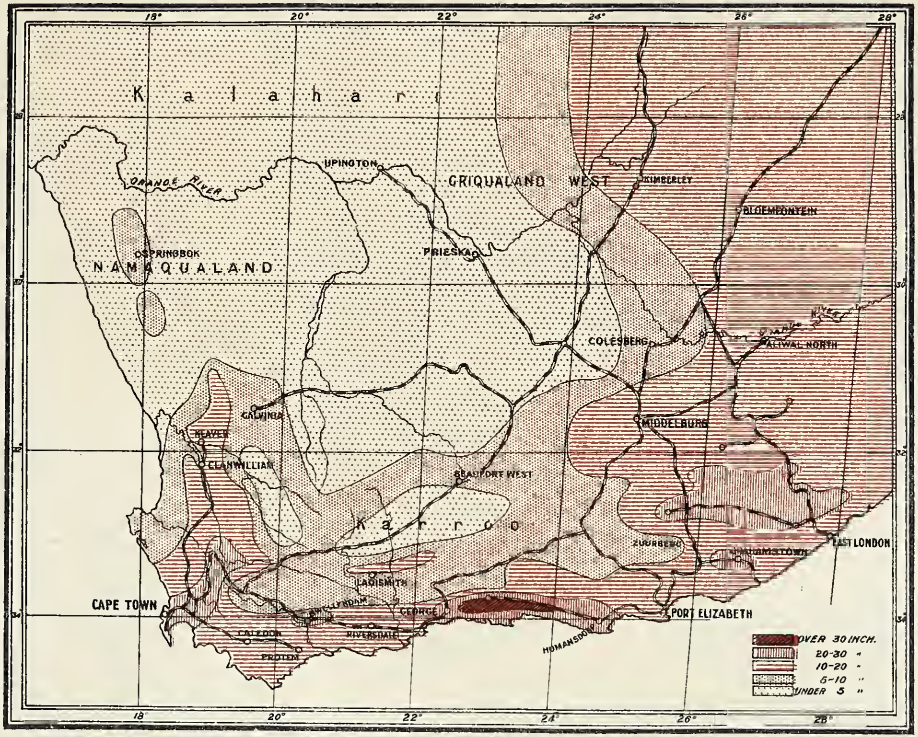


AVERAGE ANNUAL RAINFALL
MAP OF THE
UNION OF SOUTH AFRICA.

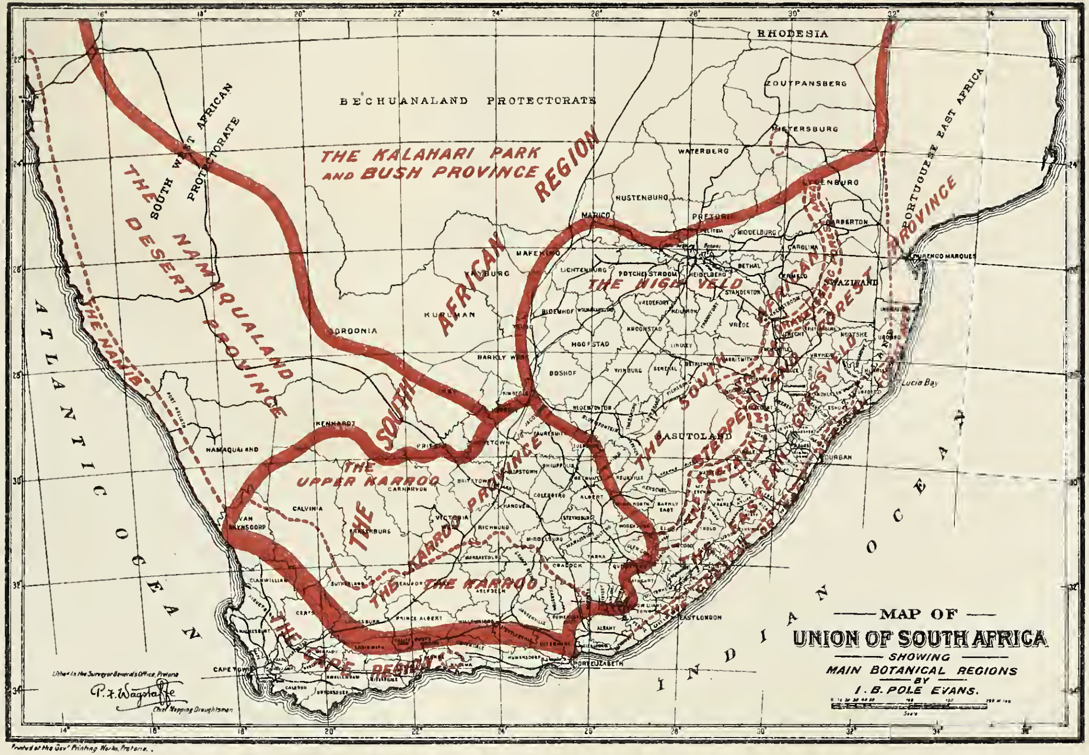
Map III.

MAP OF MINIMUM RAINFALL

During the Period 1885-1894.



From R. Marloth, Das Kapland.



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CHAPTER III.

THE MAIN BOTANICAL REGIONS OF SOUTH AFRICA.

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That part of Africa which lies south of latitude 22° falls naturally into two main botanical regions—the Cape region and the South African region. The former is of comparatively small extent and occupies the angular strip of country in the south-west portion of the Province of the Cape of Good Hope. The latter is of vast proportions and covers the rest of the country under review. The vegetation of the Cape region has a remarkable uniformity of character, while that of the South African region exhibits a great variety of types ranging from typical desert to tropical forest. The Cape region differs from the South African region in one important climatic factor. It experiences a winter rainfall, whereas summer rains fall over the greater part of the South African region. This difference in the seasonal distribution of the rainfall is mainly responsible for the marked dissimilarity of the vegetation in the two regions. So different are they in aspect and composition that they have little in common and might well belong to two widely separated countries. Indeed, Bolus has well said: "The flora of South Africa cannot be treated or regarded as a whole. The diversified character of the surface of the country and the difference in the distribution and the amount of the rainfall are so considerable as to have caused corresponding important differences both in the aspect of the vegetable landscape and its systematic constituents."

The Cape Region.

The Cape region occupies the angular strip of country which is bounded by the Olifants River, the Sundays River valley, and the mountains known as the Cape ranges which form the Folded Belt. The region is commonly known to botanists as the south-western region. The country is mountainous and contains a number of deep and wide open valleys. The land rises from the coast by a series of successive ranges, which from a distance appear rugged and bare, but on closer inspection reveal a wealth of most interesting plants. Snow often lies on these mountain tops for many months in the year, while perennial streams, inland lakes, and vleis are of frequent occurrence. Rain falls mostly during the winter months (April–September) and varies from 5–40 in. per annum, although much higher amounts are actually experienced in several localities. The general aspect of the vegetation is that of shrub or low bush varying in height from 2–8 ft. It is of a dull dark green or greyish hue and consists mostly of evergreen shrubs with small tough, leathery leaves, which not infrequently assume an oblique or perpendicular position. Below these shrubs, bulbous and succulent plants are often plentiful.

The mountain slopes are usually covered with bush and shrubs which belong to the *Proteaceae*, *Thymeleaceae*, *Ericaceae*, *Rutaceae*, *Bruniaceae*, *Penaeaceae*, and *Grubbiaceae*. On the mountains in the west, the Clanwilliam cedar (*Widdringtonia juniperoides*) is endemic, while in the south the silver tree (*Leucadendron argenteum*) is typical.

On the inland valleys and plains the rhenoster bush (*Elytropappus Rhinocerotis*) and a great variety of plants belonging to the Restiaceae characterize the vegetation.

Along the rivers and vieis the Palmiet (*Prionium serratum*) and pig lily (*Zantedeschia aethiopica*) are typical. The region is noted for its great variety of proteas, heaths, and bulbous and tuberous plants. The general aspect of the vegetation bears a striking resemblance to that of the Mediterranean region, and for this reason it is frequently referred to as the "*Cape Macchia*" or "*Maquis*," Situated within this region between George and Knysna in a comparatively small area which experiences a fairly uniform summer and winter rainfall is a tract of evergreen forest. This must be looked upon merely as an outlier of the South African forests which occur on the south-eastern slopes of the Drakensberg range.

The South African Region.

This region comprises the remainder of the country under review.

It includes the greater part of South-West Africa and the Bechuanaland Protectorate, the Union of South Africa, the southern portion of Portuguese East Africa, and a narrow strip of Southern Rhodesia.

In broad outline this expanse of country consists of a great central plateau, more than 40 per cent. of which lies at an altitude of over 4000 ft. Bounding this plateau is a comparatively narrow belt of low-lying country stretching to the Atlantic Ocean on the west and the Indian Ocean on the east, while to the south it is intercepted by the chain of mountains which form the Cape ranges.

This vast region is so diversified as regards its climate, topography, and soil that several well-marked botanical provinces can be recognized. Desert types of vegetation characterize the western and southern portions of the region, where the rainfall is scanty and intermittent. Semi-deserts occur in the central portion, where the rainfall is higher, while grassland and forest cover the eastern portion, where the rainfall is more regular and the underground supplies of water more permanent.

The South African region can thus be divided into four main provinces, which may be termed :—

(1) The Namaqualand Desert Province.
(2) The Karroo Province.
(3) The Kalahari Park and Bush Province.
(4) The South African Steppe and Forest Province.

(1) The Namaqualand Desert Province includes the greater part of Bushmanland, Little Namaqualand, the broad valley of the Orange River as far east as the Asbestos mountains, the greater part of Great Namaqualand, and the narrow strip of low-lying country situated between the coast and the Damaraland Highlands.

The country consists of table landscapes, vast plateaux, and arid plains. The river-beds are mostly dry throughout the greater part of the year. The soil is usually bare, stony, or sandy, while the annual rainfall varies from under 1 in. to 10 in. and increases gradually from the west eastwards.

The general aspect of the vegetation is that of widely separated xerophytic shrubs and bushes, with a fair proportion of succulent plants in the low-lying valleys and on the rocky outcrops. Grasses do not form a conspicuous feature in the vegetation, but they occur on the high plateaux and sandy plains, where their vegetative period is short and where they are always of a tufted habit.

The Namaqualand Desert Province is characterized by the presence of *Aloe dichotoma, Euphorbia virosa, E. Dinteri, Sterculia Gurichii, Cissus Crameriana, Pachypodium giganteum* on the hills; *Parkinsonia africana, Acacia hebeclada, A. tenax, A. hereroensis, Boscia foetida, Rhigozum trichotomum, Catophractes Alexandri, Sarcocaulon Burmanni, S. rigidum* and *Hoodia Gordoni* on the plains; *Euphorbia gregaria* in the low-lying valleys, and along the dry river-beds *Acacia giraffae, Acacia albida, Combretum primigenum, Euclea pseudebenum, Tamarix articulata,* and *Sisyndite spartea.*

The western or coastal portion of this area is usually referred to as the Namib.

The Namib is a low-lying tract of country composed largely of drifting and shifting sand dunes. It is subject to more desert conditions than the rest of the Province. Some of its more typical plants are *Mesembryanthemum Marlothii, Acanthosicyos horrida, Arthraerua Leubnitziae, Welwitschia mirabilis, Zygophyllum Stapfii,* and *Euphorbia brachiata.*

Common grasses in this Province are *Aristida brevifolia, A. ciliata* and *A. namaquensis,* while in the Namib *Aristida obtusa, A. sabulicola A. subacaulis, Eragrostis cyperoides,* and *E. spinosa* are typical.

(2) The Karroo Province includes the areas commonly known to botanists as the Karroo and the Upper Karroo. The former occupies the southern portion and is a low-lying tract of country varying in height from 1000–3000 ft.; the latter comprises the northern portion and consists of wide plains lying at an altitude of 3000–6000 ft. These plains are frequently broken by table-topped hills and "spitz-kops."

The soils are mostly shallow and rock-strewn. The rainfall varies from 5–15 in. per annum and increases from the west eastwards. The country generally, except after recent rains, has a semi-desert appearance. The vegetation is composed largely of xerophytic shrubs, shrublets, and succulents. Trees are almost entirely absent except along the river-beds.

Some of the more typical plants are: *Galenia africana, Melianthus comosus, Salsola aphylla, Euphorbia mauritanica, Mesembryanthemum spinosum, Aitonia capensis, Sutherlandia frutescens, Lycium afrum, Lycium austrinum, Chrysocoma tenuifolia, Pentzia incana, Othonna pallens, Arctotis stoechadifolia,* and *Gnidia polycephala.*

In the southern portion or Karroos, succulent plants are dominant almost everywhere. Specially typical are the Cotyledons, Mesembryanthemums, Aloes, Haworthias, Gasterias, Apicras, and Pelargoniums. In the northern portion or Upper Karroo, which is subject to far greater extremes of temperature, small shrublets belonging to the Compositae are dominant.

(3) The Kalahari Park and Bush Province occupies the vast tract of country which forms the central portion of South Africa.

It includes the greater part of Damaraland, the eastern edge of Namaqualand, British Bechuanaland, Bechuanaland Protectorate, and the low-lying country in the northern and north-eastern Transvaal which is drained by the Limpopo and Olifant's Rivers.

The country, as a whole, forms a shallow basin in the interior, which is drained on the south by the Orange River and on the north-east by the Limpopo.

The country is one of vast sandy plains, except in the north-eastern portion, where it is considerably broken by the Waterberg and Zoutpansberg mountains.

In the south-western portion the surface is covered with gigantic sand dunes.

The rainfall varies from 10–30 in. and increases from the west eastwards. The greater portion of it falls during the summer months and mostly accompanying tropical thunderstorms.

The vegetation is composed of trees, scattered bush, and grass. Over the greater portion of the country the general aspect of the vegetation is park-like. Towards the east where the rainfall is higher and more regular, the bush becomes denser and thicker.

Thorn trees, mostly species of acacia, are the dominating feature of the bush.

Typical and widely distributed plants throughout this area are *Acacia giraffae, A. detinens, A. spirocarpoides, A. hebeclada, Dichrostachys nutans, Terminalia sericea, T. pruinoides, Boscia Pechuelli, B. Rehmanniana, Zizyphus mucronata, Rhus viminalis, R. lancea, Olea verrucosa, Peltophorum africanum, Tarchonanthus camphoratus, Grewia flava, G. cana, Royena pallens, Cassia obovata*, and *Citrullus vulgaris*.

In the northern portion. tropical African vegetation is met with and is characterized by the presence of *Adansonia digitata, Copaifera mopane, Hyphaene crinita, H. ventricosa, Excoecaria africana, Balsamodendron africanum, Commiphoras, Sterculias*, and *Aloe rubrolutea*.

Some of the more typical grasses of this area are *Aristida adscensionis, Aristida uniplumis, A. mollissima, Eragrostis denudata, E. lehmanniana, E. truncata, Fingerhuthia africana, Anthephora pubescens, Panicum Marlothii, Panicum Holubii*, and *Schmidtia bulbosa*.

(4) The South African Steppe and Forest Province occupies a large portion of the eastern side of South Africa. It includes the high-lying country in the north-eastern portion of the Province of the Cape of Good Hope, the greater part of the Orange Free State, and the southern Transvaal, together with the country which lies between this and the Indian Ocean. It thus embraces Basutoland, Tembuland, Pondoland, Griqualand East, Natal, Zululand, Swaziland, and the low-lying strip of country in Portuguese East Africa east of the Lebombo range.

In marked contrast to the areas already dealt with, this tract of country is well covered with grass, in fact, grass is dominant everywhere except where forest patches occur.

Within the Province itself there are several distinct climatic areas, and these exhibit corresponding differences in their botanical features. The western portion, which includes the High Veld, is typical "steppe" country in which *Themeda triandra* is dominant. The high mountainous tract of country forming the Drakensberg range contains typical forest vegetation. The terraced country between the Drakensberg and the coast is typical savanah, while the frostless coast belt is covered with bush and forest which contain many plants characteristic of tropical Africa.

The South African Steppe and Forest Province thus includes the High Veld or Steppe area, the Eastern Mountain or Drakensberg Forest area, the eastern grassveld or Savanah area, and the Coastal or East African Forest area.

The High Veld consists of vast rolling plains covered with grass and devoid of indigenous trees and bush. Its average height above sea-level is between 4000 and 5000 ft. The rainfall varies from 25–30 in., most of which falls during the summer months, while the whole area is subject during the winter to severe frosts. The dominant grass is *Themeda triandra*. Other common and typical grasses are *Tristachya Rehmanni, Heteropogon contortus, Andropogon amplectens, A. schirensis, Monocymbium ceresiiforme, and Urelytrum squarrosum.*

The Eastern Mountain or Drakensberg Forest area includes the mountainous country which forms the eastern escarpment of the South African plateau. The mountains vary in height from 6000–10,000 ft. and enjoy a rainfall of 30–60 in. in summer, while snow frequently lies on them in winter. The forests are made up largely of *Podocarpus elongata, P. latifolia, Olea laurifolia, Celtis kraussiana, Curtisia faginea*, and *Xymalos monospora*. The characteristic grasses are *Agrostis suavis, Anthoxanthum Ecklonii, Avenastrum caffrum, A. turgidulum, Festuca caprina, F. costata, F. scabra*, and *Harpechloa capensis*.

The eastern grassveld or savannah area lies between the coast and the eastern escarpment. Its average height above sea is from 1000–4000 ft., and it rises from the coast by a series of terraces. The average rainfall is from 25–40 in. The general aspect of the country is that of grassland with scattered thorn bush and succulents. The dominant grasses are *Themeda triandra, Eragrotis plana, Sporobolus indicus, Hyparrhenia hirta, A. amplectens*, and *A. schoenanthus*. The thorn trees comprise mainly *Acacia karroo, A. caffra, A. Benthami, Dichrostachys nutans, Ehretia hottentotica*, and *Zizyphus mucronata*. The chief succulents are *Euphorbia grandidens, E. Cooperi, E. ingens, Aloe ferox, A. Marlothii*, and *A. Bainesii*.

The Coastal or East African Forest area extends inland to an altitude of 1000 ft. It has a fairly regular rainfall of 30–40 in. and a uniform temperature which is sub-tropical to tropical. Consequently the country is covered with more or less dense bush and forest patches. The trees composing this bush are *Mimusops caffra, Rhus longifolia, Albizzia fastigiata, Millettia caffra, M. sutherlandi, Harpephyllum caffrum, Macaranga capensis, Rauwolfia natalensis, Rhus laevigata, Hyphaene crinita, Phoenix reclinata*, and *Strelitzia augusta*, most of which have tropical African affinities.

CHAPTER IV.

INSTRUCTIONS FOR COLLECTING AND DRYING BOTANICAL SPECIMENS AND FOR WRITING THEIR ACCOMPANYING TICKETS.

By Mrs. F. Bolus, B.A., and R. Marloth, Ph.D.

1. *Apparatus.*—Provide a collecting-frame or two cardboards joined by straps, paper, field-labels, notebook, haversack, pocket-knife, and digger.

If a collecting-frame is not available, two or more cardboards, 17 by 11 in., are necessary to give rigidity to the parcel.

The paper, used for laying out the plants upon and for putting between the layers, should be cut to a uniform size, say, 16 by 10 in. Ordinary unglazed newspaper will serve, but would naturally wear out far more quickly than a strong brown paper, and in some cases scarcely repay the labour of cutting down to size. Copies of the "Farmer's Weekly" or *Government Gazette* will be found useful, as being approximately the size required.

The field-labels, measuring, say, 3 by 5 in., should have two slits cut in them beforehand, so that they may be more readily slipped on to the specimen. All information asked for should be filled in according to the directions given at the end of this article and on the fly-sheet of the block of labels.

The notebook is used for recording the date (day, month, and year) on which the collection is made, and the station, locality, proximity to nearest town, district, geographical division, altitude. In addition to the geographical information it is necessary to state the "habitat"* or habitats covered by the station. A collecting excursion may embrace more than one habitat. For example, an expedition to the nearest hill may include the following habitats: (1) level ground; (2) river-banks; (3) river-bed; (4) rocky hill. Habitats may be further described under the following headings: (1) soil—whether sand, clay, loam, humus, lime, etc.; (2) water—whether very wet, wet, moist, periodically wet and dry, dry, very dry; (3) light—whether densely shaded, shady, diffused light, full sunlight.

The haversack is for holding the more rigid plants, like thorny *Euphorbiae*, etc., which would injure the more delicate ones in the papers, and for succulents, which do not require to be put between papers immediately.

2. *How to Collect.*—In exploring a given locality botanically the collectors should aim: (1) at getting a complete toll of the flora of the locality, and (2) at getting the specimens which represent that toll as perfect as possible. To be perfect a botanical specimen should have root, stem, leaves, flowers (open and in bud), and fruit (young and mature). This, however, is not always possible, and in the case of large plants is quite impossible. One should avoid getting scraps or fragments—flowers without leaves or leaves without flower—which are comparatively useless, though some additional flowers, dried separately, add considerably to

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* For a list of habitats see Appendix I.

good specimens. The collector should bear in mind when selecting specimens that the herbarium-sheets on which the specimens will be mounted eventually, measure 10 by 16 in.

Small Annuals.—Complete specimens of these can usually be collected, showing root, stem, leaves, flower, and fruit.

Shrubs and Trees.—Branches may be taken when in flower, showing the open flower and the buds. Later on when the fruit is ripe more branches should be gathered as fruiting specimens. The leaves on these specimens may not show the full size attained on the plant. Half a dozen of the largest leaves should therefore be gathered to supplement those on the branches. If the bark shows any peculiarity, pieces may be stripped off and dried.

Bulbous Plants.—Complete specimens of these can usually be obtained. If longer than 16 in. the leaves and flower-stalk can be bent once or twice to meet the required size. The bulb itself should be sliced off (and the slices dried) on each side, so that it may lie flat in the press. If this is not done it tends to be squashed out of shape. Corms (" dry bulbs ") do not require to be cut in this way.

Oxalis should always be collected with its bulbs, which should be dried whole.

Succulent or Fleshy Plants.—The leaves and stems of these often take much longer to dry than do the flowering portions, which get too much dried and are apt to fall to pieces. Separate specimens, therefore, of the flowering parts should be dried to supplement the others, which are left *in situ* merely to show their position. Care should be taken to attach the proper number to the flowers.

Grasses.—Specimens of these must show the root and lower leaves, as well as the erect stem (culm) which bears the inflorescence. As it is important to know how many nodes the culms have, the taller ones should be bent to size before drying. They are inclined to snap and break if bent after being dried. If the grass grows in thick tufts, the latter may be broken up into pieces—each piece showing a few roots and lower leaves with one to four culms.

The collector should aim at getting about twelve " sets " of each species. A set varies according to the nature of the plant. A single branch, if provided with a fair supply of flowers, and another with fruit will constitute a set. Of annuals three to four specimens, of bulbous plants two to four specimens, of grasses two to four if small plants, and one if large, will constitute a set.

3. *How to Dry.*—In the field the collector should endeavour to get his plants between the papers as soon as possible to avoid the risk of their wilting, or in the case of heaths of the leaves dropping. One or two sheets of paper between each layer of plants will be found sufficient at this stage. Each layer should be filled with as many plants as it will hold without overlapping. Throughout the drying process care should be taken to see that the corners are filled first, before anything is placed on the other available spaces on the sheet—the tendency being for the centre to bulge and the corners to be insufficiently pressed. The base of the specimen should be directed towards the edge of the sheet so that the younger and tenderer portions may be protected more within. One specimen of each species is provided at once with its field-label. On returning to the base

of operations the collector proceeds to sort out the more rigid specimens from the more delicate ones, and either uses separate presses or puts a rigid cardboard between—his object being to get as smooth and even a pressure as possible. Instead of one or two sheets of paper between each layer of plants at least eight or ten will be required now. It is necessary to keep a sharp lookout for stray insects, especially caterpillars which, if overlooked, are capable of ruining a specimen.

When the pile reaches 8–12 in. in height fasten with a tight strap or rope, or much better, put on the top a weight of heavy stones, or tins, or bags of sand, of about 80–100 ℔. Experience will teach the desirable weight—rigid, dry shrubs need more ; soft and especially succulent and damp plants need less pressure.

The first change of papers should take place within twenty-four hours. This shifting is the great secret of thoroughly satisfactory work. If left too long, fermentation sets up in the tissues of the plant, and they become rotten internally instead of drying, and eventually fall to pieces. Except in the case of grasses and grass-like plants it is advisable to make the second change within twenty-four hours of the first, allowing the intervals of time to increase gradually from two days to every three days or four days. It is impossible to give accurate directions, since so much depends on the dryness or moisture of the climate, as well as on the degree of succulence of the plants or the thickness of their parts. The best time to change plants, in the earlier stages, is in the late afternoons or evening. During the heat of the day the plants will tend to part with a considerable amount of their moisture, and to leave them for a night between the warm damp papers would be likely to cause fermentation and rotting.

If time allows and the specimens are not frail, it is as well to shift each specimen separately on to a dry layer ; otherwise the whole layer may be moved bodily without disturbing the separate specimens.

The same papers may be used over and over again until worn out, so long as they are dried in wind or sun during the intervals of changing.

There are certain thick and fleshy plants which dry more quickly if they have a little treatment before being put in the press. Thick inflorescences like those of *Aloe* and *Protea* may be cut down the middle longitudinally and dried in two halves. In the case of fleshy *Pelargonia* and *Euphorbiae* the whole plant, or its branches, may be cut from the bottom to the top, and all the pith in the centre scooped out, leaving only the bark, with the leaves, flowers, and fruit in position. The stems of *Stapeliae* may be treated in the same way.

Of plants with delicate corollas (*Homeria*, *Moraea*, etc.), some flowers should be placed between sheets of thinner paper and left undisturbed in them throughout the drying process.

4. *How to Kill.*—Succulent plants will scarcely make satisfactory botanical specimens unless they are killed before being put in the press. The old method of killing was to dip the specimen, all but the flowers, in *nearly* boiling water for a few seconds. Another method is immersion for twenty-four hours in a 3–5 per cent. solution of formalin. A third method, considered the best by the most experienced people, is immersion in a saturated solution of corrosive sublimate. This last requires very careful handling. The specimen should be attached to a string and be let down into the vessel, remaining five to thirty minutes, according to its thickness. The plants may be placed straight from the killing-mixture into the press. Perhaps the easiest method of killing is with sheep-dip (Cooper's). One teaspoonful mixed with half a pint of cold water will be found sufficiently

strong. The cut end of the stem, for an inch or two of its length, is placed in the solution for twelve to twenty-four hours. On removing it from the solution the yellow powder of the sheep-dip should be rinsed off before the specimen is put in the press.

NOTE.—When sufficient numbers of dried specimens have accumulated for transmission to their destination they may be packed in a parcel, with only one sheet of paper between each layer, care still being taken to see that no plants overlap one another. A cardboard should be placed on the top and bottom of the parcel, and the parcel should then be *firmly* tied so that there is no danger of the specimens being moved about. Over this is fastened the outside wrapper of brown or several layers of newspaper, securely tied.

NOTES ON THE RECORDING OF PARTICULARS ON THE FIELD-LABEL WHEN COLLECTING PLANTS.

1. *Name.*—If genus or species not known, state some general or common name, e.g. heath, pijpie, keur, etc.

2. *Underground Parts.*—Roots fibrous, fleshy, woody, near surface or deep going, short, long, numerous, etc. Rootstock, corm or bulb, etc. Size and shape of the latter may be indicated by pencil sketch.

3. *Habit and Size.*—Herb, sub-shrub, shrub, arborescent, tree, or succulent. Annual, perennial, deciduous or persistent foliage, creeping, prostrate, depressed, erect, climbing, twining, etc. Time of flowering and fruiting. Colour of flowers, etc.

4. *Habitat.*—(See notes by Dr. Bews.)

5. *Frequency.*—(See notes by Dr. Bews, using his signs.)

6. *Plant Community or Principal Associated Plants.*—This is best explained by a few examples from the Cape Peninsula :—

(*a*) *Disa graminifolia* (blue disa). Grassy slopes of upper parts of Table Mountain. Among *Restiaceae* with *Agapanthus* and *Erica coccinea.*

(*b*) *Phylica capitata* (Featherhead). Protea scrub in Orangekloof. Principally *Protea grandiflora, P. incompta, Rhus tomentosa, Watsonia rosea, Aristea capitata.*

(*c*) *Stapelia variegata.* On rocky slopes of the north side of Table Mountain. With *Euphorbia Caput-Medusae, Kleinia repens, Othonna arborescens.*

7. *Locality.*—Not only the district, but something more accurate, perhaps the farm or the distance from a town or village, or railway station, indicating direction, etc., unless the plant be of common occurrence.

It is an excellent plan for a collector, whether stationed at one place or travelling, to keep a register of the localities visited and to enter all details concerning them, for reference at any time later on. Good examples of such registers are found in Burchell's, Drege's and Pearson's accounts of their travels. Also in Bolus and Dod's " Cape Peninsula Plants."

Specimen of Field-Label (5½ in. by 8 in.).

BOTANICAL SURVEY OF SOUTH AFRICA.

District.......................

Coll. No...

Common Name...

Underground Organs...

Habit and Size...

Habitat..

Frequency..

Plant Community of Principal Associated Plants.................................

....

Locality..

Alt.................................. Date....................... Coll. by..............

Economic or Biological Notes by...

CHAPTER V.

METHODS OF BOTANICAL SURVEY: SUGGESTIONS FOR THE BEGINNING OF THE WORK AND PROPOSED CONVENTIONAL SIGNS.

By Professor J. W. BEWS.

It is sufficiently obvious that we should take advantage of the work that has been done elsewhere, and each worker should be urged to make himself as well acquainted as possible with the increasing literature of the subject. Since there is, however, a certain danger of becoming too diffuse amid the rather bewildering details of a multitude of publications, the beginner will do well to confine himself to certain well-known works at the outset. Assuming that he has had the usual preliminary botanical training of our universities, he will already have learned the main facts that are necessary and a course of reading on the lines of the following works will give him the proper outlook :—

Warming, E...........	" Ecology of Plants " (English edition).
Clements, F. E........	" Research Methods in Ecology."
	" Plant Succession."
	" Plant Indicators."
Tansley, A. G.........	" Types of British Vegetation."

This should be followed by a study of the various South African ecological publications listed elsewhere. Other ecological papers will come to his notice from time to time. He should note any new ideas or general principles or methods of treatment and consider their applicability to South Africa. His greatest difficulty will soon appear to be not to find work to turn his hand to, but to decide which of the many useful and interesting problems should be tackled first.

Some of those who have begun the study of plant ecology find it difficult to take a big view of natural phenomena and to grasp the general principles involved. To those who have devoted attention chiefly to minute studies in plant morphology or physiology, there sometimes comes a kind of mental myopia. It is literally true that they cannot see the wood for the trees. The ecologist tries to see both the wood and the trees, shrubs, herbs, climbers, and everything else that composes it. He has come to realize that any type of plant community, such as a forest, obeys certain laws of development and passes through certain stages of growth which are in many ways analogous to the life-history of an individual plant. Ecology thus has much in common with the science of sociology.

Many complaints are made concerning the system of nomenclature adopted by various ecologists. Similar complaints are levelled against the whole science of botany itself. We are constantly asked why plain English terms cannot be used instead of those derived from Latin or Greek, or, what is still worse, barbaric combinations of the two. The answer is that loose descriptive language without clearly defined terms leads to nebulous and confused thinking. Once a new idea or a new fact is clearly grasped, a proper term applied to it helps to fix it in one's mind. Words already in use for other ideas cannot very well be used, and besides it is convenient to have terms which tend to become international. In a young science, such as ecology, some time must elapse before there is general agreement regarding the use of new terms. As our ideas become clearer, there is, however, a gradual approach to uniformity. The term "plant community" is used in a perfectly general way for any assemblage of plants. The term "formation" is best restricted to the climax units of vegetation, i.e. the stable vegetation of an area where the factors of the habitat are more or less uniform, e.g. bush or forest, grassveld, scrub (sometimes), macchia, etc. If the plant community, as in the case of much of our eastern scrub, gives way in the course of time to another type, e.g. forest, then it is not climax and is not a "formation." The plant "associations" are the subordinate units dominated by two or more species which are associated regionally to constitute the formation, e.g. *Podocarpus-Olea* association in the forest formation. If there is a single dominant species the term "consociation" is used, e.g. *Podocarpus falcata* consociation in forest. If the vegetation type is not climax but represents merely a stage in the succession, the terms are altered to show this, e.g. *Leucosidea-Buddleia* "associes" or *Leucosidea* "consocies."

Smaller plant communities are designated by the terms "society" if climax, or "socies" if not climax. There are seasonal or "aspect" societies with local dominance (either "vernal," "aestival" or "autumnal") scattered through our grassveld, e.g. numerous species of *Compositae*, *Leguminosae*, bulbous plants, etc., and there are numerous "layer societies" in the forest. If the grassland is of a primitive kind, these scattered patches of associated plants form "socies" rather than "societies." The term "clan" is used by Clements for a still smaller (climax) unit, scattered and isolated. The term "colony" is used for small clumps of pioneer plants.

Clements advocates the use of the term "sere" for a definite plant succession. A succession beginning in water is called a "hydrosere." There is a considerable degree of uniformity in its stages: (1) submerged aquatics, (2) floating aquatics, (3) reed stage (phragmites), (4) sedge stage (*Cyperaceae*), (5) vlei grasses, (6) hydrophilous trees and shrubs or moist grassveld, and (7) forest or grassveld. A succession beginning with bare land or rock is called a "xerosere," and it leads on to the climax vegetation of each climatic region. The xerosere may be divided into the "lithosere" for rock surfaces and the "psammosere" for sand. Note that both the "hydrosere" and the "xerosere" tend to converge towards the same climax.

While ecology has many different aspects suited to different individual tastes, the beginner will do well to concentrate for a time on the study of habitats. The facts to be ascertained are so numerous that there is an imperative need of dealing with them in a systematic way. For the instrumental methods of investigating habitats, Clements' Research Methods" should be consulted. The subject is too big to enter on here. The plant collector, however, can do much to systematize the facts that come under his observation by working according to a well-defined scheme.

The chief factors to be noted for each species are :—

(1) Nature of soil, both chemical and physical—sand, clay, loam, humous, calcareous.

(2) *Water.*—The gradations: very dry, dry, periodically wet and dry, moist, wet, very wet.

(3) *Light.*—Densely shaded, shady, diffuse light, full sunlight.

(4) *Temperature.*—Presence or absence of frosts in winter, and extremes generally.

(5) Other species of plants associated and their influence and relationships.

(6) Occasionally other factors, e.g. wind-swept habitats, salt spray, etc.

The following list of typical South African habitats is not to be considered exhaustive, but suggestive rather of the kind of detail that is wanted.

In the primitive stages of the plant successions, the influence of other species is not so important. In climax stages the associated plants are of the utmost importance.

1. *Smooth Bare Rock.*—Horizontal.
2. *Smooth Bare Rock.*—Sloping (give aspect, e.g. N.E.).
3. *Moss or Lichen-clad Rock.*
4. *Cliffs.*—Perpendicular or sloping (give aspect). (The geological nature of the rock, e.g. granite, dolerite, shale, sandstone, the amount of water from wet to dry, the amount of light from shady to fully exposed, should be given in each case.)
5. *Rock Crevices.*—Horizontal or vertical. Shallow or deep. Describe the soil if present, and other factors: (*a*) wet crevices, (*b*) dry crevices, (*c*) shady crevices, etc.
6. *Rock Ledges.*—Give depth and nature of soil and water and light as before.
7. *Rock Flushes.*—(Water-dripping crags.) State whether water is permanent or seasonally periodic.
8. *Boulder Slopes.*—Describe soil, water, and light.
9. *Gravel Slopes.*—Describe soil, water, and light, and give origin of the gravel and depth. Give the aspect.
10. *Stony Patches.*—Horizontal.
11. *Termites' Nests.*
12. *Sandy Patches.*—Describe the sand and give the depth.
13. *Rocky Seashore.*
14. *Sandy Seashore.*
15. *Sand Dunes.*—Give full description of all the above factors and state whether dunes are "fixed" and covered with vegetation, or are nearly bare and mobile.
16. *Blow-outs among Dunes.*—Describe all the factors as before. Especially note the species which colonize in dune areas.
17. *Roads and Footpaths.*—State how much used, and in case of abandoned roads, if possible, state how long since used.
18. *Rubbish Heaps, Waste Land,* etc.
19. *Old Walls.*
20. *Quarries,* etc.
21. *Cultivated Land.*—Give the crop.
22. *Fallow Land.*—State when it was ploughed last, if possible.
23. *Ditches, Sewers, Tanks,* etc.
24. *Ponds, Pools, Lakes.*—Give size. Give depths of the water. State whether it is stagnant.
25. *Vleis, Fresh Water.*—Give particulars of degree of stagnation in the water and amount of water present. If possible, refer the species to the particular "zone" to which it belongs, e.g. reed zone (phragmites), sedge zone (cyperus), or give the dominant species along with which or among which it occurs.
26. *Salt Marsh* (near sea).
27. *Lagoons.*

28. *Mud Flats.*
29. *Salt Pans.*
30. *Springs.*
31. *Warm Springs.*
32. *Sulphur Springs.*
33. *Iron Springs.*
34. "*Flushes.*"—On hillsides below springs.
35. *Streams.*
36. *Rivers.*—State the exact nature of river or stream bank, describing all the factors as before and noting other species associated. Especially note gravelly, sandy or mud banks.
37. *Dongas.*—Give size and depth approximately and describe all the other factors.
38. *Kloofs, Ravines.*
39. *Ant-bear Holes.*

The above are for the most part of a relatively primitive and unstable nature.

In the more highly developed plant communities, the habitat has been influenced by the vegetation itself, and each species is definitely related to the other species growing with it. This relationship must be brought out in describing the habitat.

In the larger sense the habitats are few in number, including :—

(1) Desert plains, stony or sandy.
(2) Karroo plains.
(3) Grass-veld of different types.
(4) Tree-veld.
(5) Various types of scrub and macchia.
(6) Forest.

After naming the particular type the chief factors should again be noted : soil, water, and light.

The character of the surrounding species and, if possible, some of their names should be given. Where a species is being suppressed by others this should be carefully noted.

It should be noted whether a species is marginal in the forest or not.

Various layers should be distinguished—trees, under shrubs, under herbs, epiphytes, climbers.

The following commonly accepted symbols may be used to denote frequency :—

d. = dominant.
s.d. = sub-dominant.
l.d. = locally dominant.
l.s.d. = locally sub-dominant.
a. = abundant.
l.a. = locally abundant.
f. = frequent.
l. = local.
o. = occasional.
r. = rare.
v.r. = very rare.

After a beginning has been made with ecological collecting on these lines, the worker will probably find that his interest is attracted to the behaviour of certain definite species. He should always be on the outlook for cases of plants being suppressed by other plants, for this throws valuable light on the question of plant succession. In fact, wherever a species is found to be dying out from an area the cause should at once be looked for. Important general processes may nearly always be brought to light.

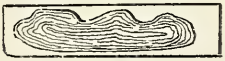
It is to be strongly urged that each worker should undertake to make an intensive study of one or more of the most interesting plants growing in his immediate neighbourhood. Each species should be observed throughout the year. The nature of the root system and its relationship to the soil, the nature of storage organs, the position and behaviour of renewal buds, the aerial growth form and its changes, the detailed morphology and physiological anatomy of stem and leaf, the general physiological behaviour of the plant as a whole, the various reproductive processes, the pollinating agencies, the characters of the seed and agents of dispersal, agents which destroy the seed and enemies generally which attack the plant, the behaviour of the seedling and factors which influence its growth and establishment; all these points should be carefully noted.

If any friend of the Survey wishes to help it in its appeal to young workers, he might do so by offering an annual prize for the best autecological study of this kind submitted to the committee. The study of a single species in this intensive way may bring to light many important facts of a general bearing. It may be well to point out that still more valuable results are likely to be obtained by using the comparative method, i.e. by comparing the behaviour of two or more species under varying conditions.

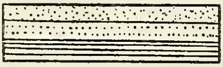
After the worker has spent some time on intensive work as outlined above, he may find it interesting to carry out some more extensive investigations on the vegetation of his neighbourhood. After he has learned to recognize the chief types of plant community, their distribution over an area may be mapped. Separate colours for the different communities may be used, or superposed conventional signs employed. Some general experience in map construction is necessary, but the "farm survey" maps may be used as a basis. The preparation of vegetation maps, however, is by no means to be considered the chief aim of a botanical survey.

PROSPOSED CONVENTIONAL SIGNS.

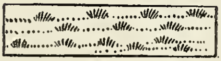
These follow, as far as possible, the ordinary text-books of surveying, but are modified to suit South African conditions :—



Water.—Lake, pond, or river. Thin parallel lines conforming to the windings of the shore. Lines close together near to the margins.

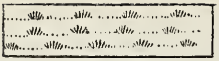


Sand.—Represented by fine dots evenly distributed over the surface. Along shore, dots arranged in lines parallel to the water between tide marks. A full line represents high water mark.

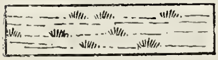


Grassland.—Represented by groups of from five to seven fine dots and dashes, representing tufts of grass distributed evenly over the surface. The base of each tuft should be parallel to the lower edge of the map, while the dashes increasing in length from the ends to the centre will give each tuft a rounded top. The dashes should be drawn in a direction radiating from a point below the middle of the bases.

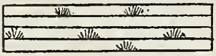
Signs not to be in rows. Groups of dots in light spots will correct an uneven distribution of tufts. Where the grasses are tall the tufts should be slightly longer.



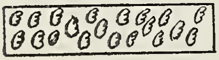
Cultivated Grassland.—The signs are in regular rows.



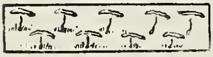
Vleis.—Represented by a combination of tufts, with horizontal lines representing water.



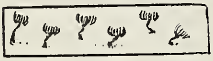
Salt Marsh or Salt Pan.—The horizontal lines are continuous.



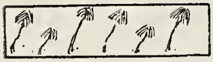
Tree, General.—Represented by clusters of scalloped curves *convex outward,* giving the appearance of the tree in plan. To give relief the curves on the lower right-hand sides are made heavier in conformity with the usual assumption of light coming from the upper left-hand at an angle of forty-five degrees. For High Forest the signs are placed closer together



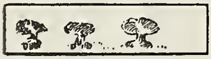
Thorn-veld.



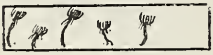
Euphorbia-veld



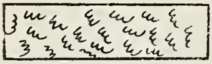
Palm-veld.



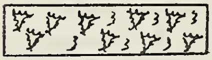
Baobab-veld.



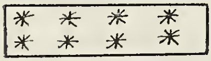
Aloe marlothii Assoc., etc.



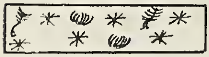
Scrub.—Scalloped curves *concave* outwards (*cf.* " High Forest "). A glance at the marginal line serves to distinguish scrub and forest.



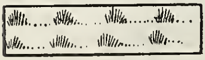
Macchia or Fynbosch.—Small isolated concave curves incomplete and small signs for trees and dots.



Succulents.—Represented by asterisks This may be used also for the Karroo generally, together with scattered bushes drawn in elevation as explained under " Tree-veld."



Karroo.—Conventional shapes for dominant shrubs to be selected.



Sugar-cane Plantations.—Tall grass tufts in rows (*cf.* " Cultivated Grassland").

The aims of our Botanical Survey, as explained in the introduction to this guide, are very wide ; while ecological studies will form an important part of the work, there are other aspects which may appeal more to individual tastes. After a beginning has been made in plant collecting, the worker may feel inclined to make an intensive study of some particular family or ecological group of plants. Other workers will co-operate and assist him in studying their distribution over South Africa. Geographica distribution in the wider sense affords a key to such important questions as the origin of the South African flora. Various lines of migration may be traced. Mountain ranges and river valleys are particularly important in this connection. Interesting theories have already been put forward, but most of them require a great deal of confirmation. To help this kind of work forward we require to increase the number of accurate local check-lists or "floras." Each worker therefore should endeavour to compile as complete a record as possible of the plants occurring in his neighbourhood, even if he does not intend to use the facts ascertained for ecological or other work of his own. Such local lists are of the greatest possible assistance and service to the Botanical Survey as a whole.

CHAPTER VI.

NOTES ON THE PROPER USE OF THE COMMON NAMES OF PLANTS.

By R. MARLOTH, Ph.D.

THE common names of plants are often considered to be useless for scientific purposes, as the same name is not rarely applied to different species, and the same species may be known under different names in the various parts of the country. In spite of this unreliability they are, however, very useful if accepted with sufficient care and discretion.

For the collection of information on the medicinal properties of plants or on plants which are considered to be the cause of disease of animals or on plants useful as stock food, etc., the necessity for an acquaintance with the common names is too obvious to require further proof. Not less important, however, is it also for the purely vegetational work, for as the number of botanists in the various areas is far too small for the task before them, one cannot hope to achieve a fair amount of success without enlisting the assistance and co-operation of those members of the public, especially among the farming community, who do take some interest, and if it were for utilitarian purposes only, in the indigenous vegetation of the country . . . and this cannot be done without accepting and employing the names familiar to these voluntary helpers.

If, e.g., we want to chart the distribution of such a conspicuous plant as the spekboom (*Portulacaria afra*), it would be hopeless to use the botanical name only, for in that case members of the botanical staff would have to travel from farm to farm and spend much time there in exploring them, but the common name will be familiar not only to the farmers, transport riders, etc., but also to the magistrates, teachers, road and scab inspectors, etc., and consequently it should be possible to obtain the desired information by issuing circulars to the various authorities, public bodies, Government officials, private persons, etc.

The same argument will apply to questions concerning localities of the boundaries of different botanical regions, e.g. between the Karroo and the south-west, or the Karroid plains and the High Veld, or the borderland of the Kalahari, etc. ; hence in many cases the common names have to be used. In doing so, however, precaution must be taken that this use does not lead to confusion, and it is principally for this reason, viz., to secure the benefits of their use without running the risk of uncertainty from a scientific point of view, that these notes are inserted in the guide.

The need for such precaution will be best illustrated by a few examples.

One of the few generally known South African drugs is buchu, and one should consequently expect that there could be no question about its identity. Yet, there are quite a number of buchus. In commerce only two kinds are recognized, viz., the round-leaf buchu from *Barosma betulina* and the long-leaf buchu from *B. crenulata,* the former standing much higher in value than the latter. But there are other kinds, some of them derived from allied plants, e.g. *Diosma, Agathosma,* etc., but some also from plants of different natural orders. There is a mountain in Little

Namaqualand called "Buchuberg," but the geographer, who, guided by this name, would conclude that this area bears a south-western flora, including *Barosma*, or other rutaceous plants, etc., would commit a flagrant mistake. The plant after which this mountain was named is a composite, viz., *Pteronia onobromoides*, called "buchu" by the natives on account of its highly aromatic properties and employed by them instead of the real buchu.

Let us take another case, viz., dagga. It is generally stated that the wild dagga plant is *Leonotis leonurus*, but when a few years ago an attempt was made to include "wild dagga" in the list of drugs which chemists may not sell without a doctor's prescription, it was found that there were different kinds of dagga, and that some of them were not used for smoking, like the cultivated dagga (*Cannabis indica*), but were employed for various ailments in what one may call legitimate ways. As a matter of fact there are twelve species of *Leonotis* recorded from South Africa, all more or less known under the name of dagga ; hence this name is of little use for recording the distribution of plants, unless accompanied by a specimen in each case.

Another name which is helpful when accepted with discretion, but useless and confusing when taken as having a specific meaning, is noors. It is applied to all species of thorny Euphorbias, that means to at least twenty-five different species, some of them excellent fodder plants, like *E. hystrix*, *E. enopla*, *E. caerulescens*, etc., others virulent and poisonous like *E. virosa*, *E. ledienii*, *E. ferox*, etc. ; hence the noors of one farm will be praised as a boon, while that of another may be a great pest, just as the bietouw of Calvinia (*Tripteris sinuata*) is valuable and nutritious, while that of the Eastern Cape Districts (*Dimorphotheca zeyheri*) and that of Knysna, etc. (*Osteospermum moniliferum*), are poisonous to stock.

But also in purely geographical work one has to be careful and critical before accepting the common name of a plant as a proper record of its occurrence.

One of the first experiences of the kind was made by the writer with the name "palmiet" (*Prionium serratum*). The plant is so typical in its appearance and forms such a prominent element of the swamp vegetation of the south-western districts, that a confusion with other plants appears almost impossible. When, consequently, we found the name "palmiet" mentioned on a map of the neighbourhood of Walvis Bay and Sandwich Harbour, published about thirty years ago by Stapff (not O. Stapf), this reputed occurrence of the *Prionium* so far north aroused our suspicion. Through the assistance of some friends we finally succeeded in obtaining a specimen of the plant going there under this name and found it to be *Typha australis*, a widely spread aquatic plant (bulrush). A similar case is afforded by a statement in Th. Bent's book on the "Ruins of Rhodesia," where he refers to the sugar-bush, with the name *Protea mellifera* in brackets. That species is, however, confined to the southern and south-western coast districts, while the plant seen by the explorer was probably *Protea abyssinica*.

A third instance of confusion arising out of the injudicious use of the common name is afforded by the silver tree. Livingstone ("Travels," Vol. I) mentions it in Barotseland, and Parker Gilmore ("The Great Thirstland," p. 417) near Shoshong, both travellers quoting the botanical name *Leucadendron argenteum* in order to leave no doubt about it. Both were, of course, wrong, having mistaken *Terminalia sericea* (Combretaceae) for the real silver tree, which, as is well known, occurs only in a little corner of the south-western Cape.

It is not surprising that geographers not personally acquainted with the flora of South Africa have drawn misleading conclusions from such statements, and as more such cases of confusion have been caused by the wrong use of the common name, the necessity for securing specimens for identification will be apparent to all correspondents and helpers in survey work, especially in localities which are not easily accessible.

The following list contains some of the names commonly used for several species of plants, but many others are equally uncertain :—

Aandblom (*Hesperantha, Gladiolus, Freesia*).
Africander (*Gladiolus*, many species).
Barroe (*Fockea, Cyphia*).
Boterblom (*Ranunculus, Gazania, Dimorphotheca*).
Bitterbossie (*Chironia, Chrysocoma*).
Bush Tea (*Cyclopia*, three species ; *Aspalathus*).
Daisy (many composites).
Dubbeltje (*Emex, Tribulus*).
Everlasting (many species of *Helichrysum* and *Helipterum*).
Fig Marigold (several hundred species of *Mesembrianthemum*).
Ganna (*Salsola*, four species or more).
Gousblom (many kinds).
Harpuisbos (ten or more species of *Euryops*).
Ice Plant (many species of *Mesembrianthemum*).
Jeukbol (*Drimia*, several).
Kalkoentje (*Gladiolus alatus* and others).
Kalmus (*Acorus, Alepidea, Lichtensteinia*).
Klossie (*Ixia*, many).
Kannidood (*Aloe, Gasteria, Haworthia*, many).
Wilde Kapok (*Asclepias*, various species).
Kiriemoer (*Mesembrianthemum* and *Euphorbia*, several each).
Klimop (*Cynanchum*, several species, and others).
Krentebos (*Rhus*. many kinds).
Marigold (many kinds).
Melkbos (fifty or more species of *Euphorbia*, but also *Asclepias*, etc.).
Mistletoe (*Viscum* and *Loranthus*).
Naaboom (*Euphorbia*, four species).
Nentabossie [*Cotyledon ventricosa* (Jansenville) and other species].
Noors (*Euphorbia*, various spiny species, some forming good stock food like *E. enopla* and *E. coerulescens* ; others very poisonous).
Pijpie (many kinds of *Gladiolus*).
Salie (*Salvia*, ten or more kinds).
Slangkop (*Urginea* and *Ornithoglossum*).
Taaibos (*Rhus*, many kinds).
Tulp (five or more species of *Homeria* and *Moraea*).
Uintje (many kinds).
Vingerpol (*Euphorbia*, ten or more species).
Zuring (*Oxalis, Rumex*).

[A very useful handbook on the common names of South African plants is " The Common Names of Plants," by R. Marloth, Ph.D. (published by the Speciality Press, Johannesburg).—THE EDITOR.]

CHAPTER VII.

SOUTH AFRICAN BOTANICAL LITERATURE.

By S. Schönland.

It is not the object of this article to give an exhaustive account of South African botanical literature. The "Catalogue of printed books and papers relating to South Africa," Part I—Botany, compiled by P. MacOwan and H. Bolus, and published by the South African Philosophical Society in their Transactions, Vol. II, Part III (1882), dealt mainly with systematic botany, and although incomplete even at the time of publication, described briefly 551 items on 72 pages. To bring it up to date, even within its restricted scope, would double or treble the number. Much valuable information on South African plants is contained in morphological, anatomical, physiological, and phytogeographical works and in books of travel. However, pure morphology, anatomy, and physiology will be passed over in this article. I must, however, call attention to the researches on *Welwitschia* by the late Professor H. H. W. Pearson, which were mostly published in the Trans. Roy. Soc. (Vols. CXCVIII, CC). A number of botanical books for South African schools have been published. Some of these, however, are so bad that one would only be justified in mentioning them if one were to utter a warning against their use. Amongst the few exceptions is a small book by Mrs. F. Bolus, "Elementary Lessons in Systematic Botany" (Capetown, 1919).

From what has been said it will be seen that a large library is required to cover the whole field of South African botanical literature. Good collections are found in the South African Public Library, Capetown, the Bolus Herbarium, the South African Museum, the National Herbarium, and the Transvaal Museum, Pretoria, the library of Dr. Marloth, my own library (with which is incorporated the library of the late Dr. MacOwan, and which is supplemented by the library of the Albany Museum), besides numerous smaller collections in many public and private libraries. * In connection with several libraries of University institutions in South Africa good collections are also being built up. MacOwan and Bolus, in the introduction to their catalogue, stated: "As regards our own collections, we take the opportunity of saying that we shall at all times be ready to allow scholarly use of them," and this no doubt is the attitude taken up by all proprietors or custodians of the libraries mentioned above, and, moreover, all South African botanists will always be glad to place their experience with reference to the literature at the disposal of anybody wishing to study any particular branch.

In this article the selection of works mentioned must necessarily be arbitrary and is meant to be useful rather than comprehensive. In the section "Systematic Botany—Phanerogams" special attention is given to treatises supplementary to the published volumes of the "Flora Capensis," but even with reference to these completeness could not be aimed at and isolated descriptions of new species have had to be passed over entirely.

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* See Lloyd, A. C. G.—"A List of the Serial Publications Available for Consultation in the Libraries and Scientific Institutions of the Union of South Africa." Capetown, 1921.

The love of gardening by the Dutch led to the introduction into Europe of a number of the South African plants to Holland towards the end of the seventeenth century, and the works describing and figuring their garden plants included an increasing number of these derived from South Africa. The first South African plant described and figured was most likely *Stapelia variegata* L. (in a Stapel, J. B., " Theophrasti Eresii de historia Plantarum libri decem "), which Justus Heurnius,* the first collector of Cape plants, forwarded in 1644. In the eighteenth century the English began also to cultivate South African plants until towards the end of the century our *Ericaceae, Proteaceae, Stapeliae,* etc., may almost be said to have dominated the greenhouses not only in England and Holland, but also in other European countries, where large collections of exotic plants were cultivated, as will be gathered subsequently from the enumeration of some of the most important illustrated works.

The influence of Linnaeus (1707–78) made itself felt in the general interest taken in our plants. He himself classified many of them. His pupil and, later, his successor, C. P. Thunberg (1743–1822) included the Cape in his extensive travels. Bolus and MacOwan say of him he was the first collector and botanist, after the revival of the science by Linnaeus, to grapple vigorously with the enormous mass of material presented by the Cape flora, and he might be aptly termed the father of Cape Botany. His work culminated in the first " Flora Capensis," which, in its complete form, was published in 1823 (edited by J. A. Schultes). Another work which may be mentioned, as it deals exclusively with Cape plants and is useful in identifying the figures of the older school, is by P. J. Bergius, " Descriptiones Plantarum e C.B. Sp." (1767).

Many South African plants were first published in Aiton's " Hortus Kewensis," 1st ed. 1789, 2nd ed. 1810-13. A. H. Haworth, from 1794 to 1824, wrote very largely on South African succulent plants. His most comprehensive work is the " Synopsis Plantarum Succulentarum " (1812). Much botanical information is scattered in works of travel, but there is one outstanding—namely, Burchell, W. J., " Travels in the Interior of Southern Africa " (1822). His " Catalogus Geographicus Plantarum Africae Australis Extratropicae " (14 vols.) is at Kew. The large collections made by Ecklon and Zeyher, Drège, and others led to a flood of publications by numerous authors, especially in the " Linnaea," Hooker's " Companion to the Botanical Magazine," his " Botanical Miscellany," and his " London Journal of Botany " during the thirties and forties of the last century. *Restiaceae, Cyperaceae,* and *Gramineae* were in this period first somewhat comprehensively dealt with by Nees von Esenbeck ; our Orchids were dealt with by Lindley's masterhand and later by Dr. Sonder. The scattered articles not only on our plants, but also the plants of other parts of the globe which had yielded innumerable new species owing chiefly to the collecting zeal which had been fostered by English and German botanists, created the demand for comprehensive works in which the knowledge gained could be utilized not only for deepening the study of species, but also of genera and whole orders ; in fact, for the building up of a more and more complete natural system. The most important of these works, though not specially dealing with South African plants, but indispensable to their study, are :—

De Candolle, A. P. and A., " Prodromus Systematis Naturalis Regni Vegetabilis," 17 vols. (1824–74).

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* See MacOwan, P., " Personalia of Botanical Collectors at the Cape," Trans. S.A. Phil. Soc., IV, 1884. Britten, James, " Some Early Cape Botanists and Collectors," Journ. Linn. Soc. (Bot.), XLV, 29.

De Candolle, A. and C., "Suites du Prodromus," 9 vols. (1878–96).

Kunth, K. S., "Enumeratio Plantarum," 5 vols. (1833–50).

Walpers, W. G., "Repertorium Botanices Systematicae," 6 vols. (1842–48).

—— "Annales Botanices Systematiceae," 7 vols. (1848–68).

Bentham et Hooker, "Genera Plantarum," 4 vols. (1862–83).

Baillon, H. E., "Histoire des Plantes," 6 vols. (1867–78).

Engler-Prantl, "Die Natuerlichen Pflanzenfamilien" (1889 to ——). This work, which is richly illustrated, deals with the whole vegetable kingdom, while those just previously enumerated only deal with Phanerogams.

Engler, A., "Das Pflanzenreich" (1900 to ——) (73 numbers have been published). This is the most ambitious systematic work ever attempted.

In the year 1838, W. H. Harvey published his "Genera of South African Plants." A second edition was edited by Dr. J. D. Hooker, and published in 1868. The latter is still one of the most useful books to students of South African Phanerogamic Botany. Encouraged by Sir William Jackson Hooker and his son, Dr. J. D. (later Sir Joseph) Hooker, Harvey, in collaboration with Dr. O. W. Sonder, of Hamburg, who had already distinguished himself by some painstaking researches on difficult South African groups of plants, published from 1859 to 1865 the first three volumes of their "Flora Capensis." There has seldom been a happier combination of two great men in scientific work. Unfortunately, Harvey died in 1866, and the work came to a standstill, although Sonder was already well advanced in additional parts. The work was not resumed until 1896, when, under the editorship of Sir W. Thiselton-Dyer, who contributed the prefaces to the sixth and subsequently issued volumes, the work was gradually advanced by various botanists, and is now nearly finished. It is now essentially a Kew publication, and this is only fitting from every point of view. Important parts were, however, contributed by the late Dr. Bolus, the late Dr. Pearson, and by Dr. Phillips. There is never any finality in this kind of work, especially as even now South Africa is very incompletely explored. It is no disparagement to say that it is very desirable that the first three volumes and large portions even of recent volumes should be rewritten at an early date. In the early sixties the late Dr. P. MacOwan arrived in South Africa and devoted his superabundant energies largely to the study of South African plants. He did not publish much, but helped others by his splendid collections, by encouraging other collectors, and generally by much unselfish labour. His friend, the late Dr. Bolus, worked at first on similar lines, but published a fair number of articles, contributed a large part of the account of the *Ericaceae* in the "Flora Capensis," and crowned his work on *Orchidaceae* by the publication of several finely illustrated volumes. Amongst comparatively recent collectors who contributed to a considerable extent to botanical literature (especially *Asclepiadaceae* and *Orchidaceae*) is Dr. Rudolf Schlechter, of Berlin. About thirty-five years ago Dr. Hans Schinz, of Zurich, Switzerland, undertook a journey through South-West Africa to Lake N'gami. His collections formed the basis of a large number of publications, chiefly under the title "Beiträge zur Kenntniss der Afrikanischen Flora."

When the writer arrived in South Africa a little over thirty years ago there was, with the exception of Dr. Marloth, not a single person in South

Africa who had had an all-round botanical training (all honour to such men as MacOwan, Bolus, and Medley Wood for what they achieved without it). Incidentally, it may be mentioned that there was not a single first-class microscope in the country. All this is changed now, and South Africa is, as regards trained workers, as well equipped for most branches of botanical research as any country in the world. The ever-increasing activity of botanical workers resident in South Africa will be seen by reference to the pages of the :—

- "Transactions of the South African Philosophical Society";
- "Transactions of the Royal Society of South Africa";
- "Reports of the South African Association for the Advancement of Science" (which appeared during recent years under the title "The South African Journal of Science");
- "Annals of the Bolus Herbarium" (edited by our accomplished colleague, Mrs. F. Bolus, B.A., herself a very active worker);
- "Annals of the South African Museum, Capetown";
- "Records of the Albany Museum, Grahamstown";
- "Annals of the Natal Museum, Pietermaritzburg";
- "Annals of the Transvaal Museum, Pretoria";
- "Journal of the Agricultural Department of the Cape of Good Hope";
- "Journal of the Transvaal Department of Agriculture";
- "Journal of the Union Department of Agriculture";
- "Journal of South African Natural History";
- "Journal of the Botanical Society of South Africa";
- "South African Journal of Industries";
- "Science Bulletins of the Union Department of Agriculture and of the Department of Mines and Industries";
- "Bothalia";
- "Flowering Plants of South Africa";

besides periodicals published outside South Africa (to which European botanists have also contributed many articles on South African plants). Amongst the most important from our point of view are :—

- "Kew Bulletin." *
- "The Gardeners' Chronicle."
- Engler's "Botanische Jahrbücher." †
- "Journal of the Linnean Society (Botany)."
- "Bulletin de l'Herbier Boissier."
- "Journal of Ecology."
- "Journal of Botany."
- "Annals of Botany."

The following are indispensable works :—

Pritzel, G. A.—"Thesaurus Literaturae Botanicae," ed. II, Lipsiae, 1872–77; and "Iconum Botanicarum Index," 2 vols., Berlin, 1852–66 (a new edition is in course of preparation).

Jackson, B. D.—"Index Kewensis," 1893–1921.

A very useful book is Marloth, R., "The Flora of South Africa." "Dictionary of the common names of plants with list of foreign plants cultivated in the open." Capetown, 1917.

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* See especially "Diagnoses Africanae" in numerous volumes.

† See especially Engler, A., "Beiträge zur Flora von Afrika," in numerous volumes

We proceed now to the enumeration of such works which may enable the student to get a more detailed knowledge of South African botany.

A.—Systematic Botany.

1. PHANEROGAMAE.

General Works.

Harvey, W. H., and Sonder, O. W.—"Flora Capensis," continued under the direction of Sir William T. Thiselton-Dyer; Vols. I, II, III, IV (sect. 1 and 2), V (sect. 1 and 3), VI, VII. Vol. V (sect. 2) in course of publication. London, 1860 to ——.

Harvey, W. H.—"The Genera of South African Plants," 2nd ed. by J. D. Hooker; London, 1868.

Thonner, Fr.—"The Flowering Plants of Africa," London, 1915.

Oliver, D.—"The Flora of Tropical Africa," continued under the direction of Sir William T. Thiselton-Dyer and Sir David Prain, 8 vols. completed, London, 1868 to ——.

Selected List of the Most Important Illustrated Works.

Andrews, H. C.—"Coloured Engravings of Heaths," 4 vols., London, 1802–30.

"The Heathery," 6 vols., London, 1804–12.

"Geraniums (including Cape Pelargonia)," 2 vols., London, 1805.

Bolus, H.—"Orchids of the Cape Peninsula" (with 36 plates, Trans. S.A. Phil. Soc., V, 1888).

"Orchids of South Africa," Vol. I, Part I (50 plates), 1893, Part II (50 plates), 1896; Vol. II (100 plates), 1911; Vol. III, ed. by H. M. L. (Mrs. F.) Bolus (100 plates), 1913.

Burman, J.—"Decades Plantarum Africanarum X." Amstelaedami, 1738–39.

Clarke, C. B.—"Illustrations of Cyperaceae," London, 1909.

Commelin, J.—"Hortus Amstelodamensis," Amst., 1697–1701, 2 vols.

Curtis' "Botanical Magazine." Founded by Curtis in 1787, continued to this day by Sims, the Hookers, Thiselton-Dyer, and Prain.

De Candolle, A. P.—"Plantarum Historia Succulentarum," Paris, 1799–1829.

Delessert, B.—"Icones Selectae," 5 vols., Paris, 1820–46.

Dillenius, J. J.—"Hortus Elthamensis," 2 vols., London, 1732.

Dinter, K.—"Neue und wenig bekannte Pflanzen Deutsch-Südwest-Afrikas," Okohandja, 1914. (Mostly succulents.)

Edwards' "Botanical Register," continued by Lindley, London, 1815–47.

Engler, A.—"Die Pflanzenwelt Afrikas," 4 vols., Leipzig, 1908, 1910, 1921.

Engler, A.—"Monographien Afrikanischer Pflanzenfamilien und Gattungen," Leipzig, 1898–1904; I, Moraceae (excl. Ficus); II, Melastomaceae (Gilg); III, Combretum (Engler and Diels); IV, Combretaceae (excl. Combretum: Engler and Diels); V, Sterculiaceae (Schumann); VI, Anonaceae (Engler and Diels); VII, Strophanthus (Gilg); VIII, Sapotaceae.

Marloth, R.—"The Flora of South Africa": Vol. I, Thallophyta, Archegoniatae, Gymnospermae, Dicotyledones (Part I); with 36 coloured and monochrome plates; Capetown and London, 1913. Vol. IV, Monocotyledones; with 42 coloured and 18 monochrome plates; Capetown and London, 1915. Both volumes also contain numerous illustrations in the text. Vol. II and III will complete the Dicotyledones.

Harvey, W. H.—" Thesaurus Capensis," 2 vols. (200 plates), Dublin, 1859, 1863.
Hooker, W. J.—" Icones Plantarum," London, 1837 (continued to this day at Kew by successive Directors of Kew Gardens).
Jacquin, N. J.—" Hortus Botanicus Vindobonensis," 3 vols., Vindobonae, 1770–76.
" Icones Plantarum Rariorum," 3 vols., Vindobonae, 1781–86.
" Collectanea," 5 vols., Vindobonae, 1786–96.
" Oxalis Monographia Iconibus Illustrata," Vindobonae, 1794.
" Plantarum Rariorum Horti Schoenbrunnensis des r. et ic.," 4 vols., Vindobonae, 1797–1804.
" Stapeliae," Vindobonae, 1806.
" Fragmenta Botanica," Vindobonae, 1809.
Linnaeus, Carol.—" Hortus Cliffortianus," Amstelodami, 1737.
Loddiges, C.—" The Botanical Cabinet," 10 vols., London, 1818–24.
Masson, F.—" Stapeliae Novae," London, 1786.
Redouté, P. J.—" Les Liliacées," Paris, 1802–16.
Reichenbach, H. G. L.—" Magazin der Aesthetischen Botanik, Leipzig, 1822–26.
Salm-Dyck, Prince, J.—"Monographia generum Aloes et Mesembrianthemi, 7 fasc., Bonnae, 1836–63.
Saunders, W. W.—" Refugium Botanicum," 5 vols., London, 1869–79.
Sim, T. R.—" The Forests and Forest Flora of the Colony of the Cape of Good Hope," Aberdeen, 1907.
" Forest Flora of Portuguese East Africa," Aberdeen, 1909.
Sweet, R.—" Geraniaceae," London, 1820–30.
Wildeman, M. E. de—" Icones Selectae Horti Thenensis," 6 vols., 1899–1909.
" Plantae novae Vel Minus Cognitae ex Herb. Horti Thenensis," 2 vols. 1904–09.
Wood, J. M., and Evans, M.—" Natal Plants," 6 vols., 1899–1911.

Selected List of Smaller Books and Monographic Treatises supplementary to the " Flora Capensis." (References to new genera have only been included if they are not mentioned in Thonner, " The Flowering Plants of Africa." If they are, reference to the descriptions can in most cases be found in the " Index Kewensis." No reference to isolated descriptions of new species could be made.)

GYMNOSPERMAE.

Taxaceae.

Pilger, R.—Taxaceae in " Pflanzenreich," IV, 5.

ANGIOSPERMAE.

Monocotyledones.

Amaryllidaceae.

Nel, G.—" Afrikanische Arten der Am.-Hypoxideae," Engl. Bot. Jahrb., LI, 1914.
Schönland, S.—" Klingia, a new genus of Amaryllidaceae," Rec. Alb. Mus., III, 1919.

Aponogetonaceae.

Krause, K.—Aponogetonaceae in " Pflanzenreich," IV, 13.

Araceae.

Engler, A.—Araceae in " Pflanzenreich," IV, 23.

Cyperaceae.

Kükenthal, G.—Cyperaceae–Caricoideae in "Pflanzenreich," IV, 20.

Pfeiffer, H.—"Revision der Gattung *Ficinia* Schrad.," Bremen, 1921.

Eriocaulaceae.

Ruhland, W.—Eriocaulaceae in "Pflanzenreich," IV, 30.

Iridaceae.

Bolus, L.—"Pillansia," nov. genus, in Ann. Bol. Herb., I., 1914.

Juncaceae.

Buchenau, F.—Juncaceae in "Pflanzenreich," IV, 36.

Liliaceae.

Schönland, S.—"Neopatersonia, a new genus of Liliaceae," Rec. of the Alb. Mus., II, 1911.

Berger, A.—Aloineae in "Pflanzenreich," IV, 38.

Brown, N. E.—"Sansevieria." Kew Bull., 1915.

Musaceae.

Schumann, K.—Musaceae in "Pflanzenreich," IV, 45.

Orchidaceae.

Schlechter, R.—"Revision der Gattungen *Schizochilus* Sond., und *Brachycorythis* Ldl.," Beihefte zum Bot. Centralblatt., XXXVIII, 1921.

Bolus, H.—"Orchids of the Cape Peninsula," new edition, by Mrs. F. Bolus, 1921.

Potamogetonaceae.

Ascherson, P., und Graebner, P.—Potamogetonaceae in "Pflanzenreich," IV, 11.

Typhaceae.

Graebner, P.—Typhaceae in "Pflanzenreich," IV, 8.

Xyridaceae.

Malme, G. O. A.—Xyridaceae africanae. Engl. Bot. Jahrb., 48, 287.

Zingiberaceae.

Schumann, K.—Zingiberaceae in "Pflanzenreich," IV, 46.

DICOTYLEDONES.

Archichlamydeae.

Anacardiaceae.

Engler, A.—Anacardiaceae in "Suites du Prodromus," IV, 1883.

Diels, L.—"Die Epharmose der Vegetationsorgane bei Rhus. L. (Gerontogaeae, Engl.)," Engl. Bot. Jahrb., XXIX, 1898.

Schönland, S.—"South African Anacardiaceae in the Herbarium of the Albany Museum," Rec. of the Alb. Mus., II, 1911.

Bruniaceae.

Dümmer, R. A.—"An Enumeration of the Bruniaceae," Journ. of Bot., 1912.

Canellaceae.

Pot, R.—"A New Species of Warburgia from the Transvaal," Ann. Transvaal Mus., VI, 1918.

Capparidaceae.

Pestalozzi, A.—"Die Gattung Boscia," Genève, 1898.

Crassulaceae.

Schönland, S.—"The South African Species of Cotyledon," Rec. of the Alb. Mus., III, 1915.

"The sect. Tuberosae of the genus Crassula," Ann. of the Bolus Herb., II, 1917.

"On the South African Species of Crassula (sect. Tillaeoideae)," Ann. of the Bolus Herb., II, 1916.
"Uebersicht uber die Arten der Gattung Crassula (sect. Pyramidella, Sphaeritis, Pachyacris, Globulea)," Engl. Bot. Jahrb., XLV, 1910.
"Pagella: a new genus," Ann. of the Bolus Herb. Ann. Bol. Herb., III, 67.

Cruciferae.
Thellung, A.—"Die afrikanischen Lepidium-arten." Vierteljahrschr. der Naturf. Gesellsch, in Zürich, Jahrg, 51, Heft 1, 144.
Schulz, O. L.—Cruciferae-Brassicae in "Pflanzenreich," IV, 105.

Cucurbitaceae.
Cogniaux, A.—Cucurbitaceae in "Suites du Prodromus," III, 1881. Fevilleae et Melothrieae in "Pflanzenreich," IV, 271 (1), 1916.

Droseraceae.
Diels, L.—Droseraceae in "Pflanzenreich," IV, 112.

Erythroxylaceae.
Schulz, O. L.—Erythroxylaceae in "Pflanzenreich," IV, 134.
Stapf, O., and Boodle, L. A.—"Peglera and Nectaropetalum," Kew Bull., 1909.

Euphorbiaceae.
Pax, F.—Euphorbiaceae in "Pflanzenreich," IV, 147.
Berger, A.—"Sukkulente Euphorbien," Stuttgart, 1907.
Prain, D.—"The South African Species of Cluytia," Kew Bull., 1913.
Prain, D., and Hutchinson, J.—"Notes on Some Species of Acalypha," Kew Bull., 1913.
Prain, D.—"The Merculianeae and Adenoclineae of South Africa," Ann. of Bot., XVII, 372.

Fumariaceae.
Hutchinson, J.—"The genera of *Fumariaceae* and their distribution." Kew Bull., 1921, 97.

Ficoidaceae.
Berger, A.—"Mesembrianthemen und Portulacaceen." Stuttgart, 1908.
Schellenberg, G.—"Revision der Gattung *Limeum* L.," Engl. Bot. Jahrb. L. (Supplement band).
Brown, N. E.—New and Old Species of *Mesembrianthemum*, with critical notes., Journ. Linn. Soc. Bot., XIV.

Geraniaceae.
Knuth, R.—*Geraniaceae* in "Pflanzenreich," IV, 129, 1912.

Halorrhagaceae.
Schindler, A. K.—Halorrhagaceae in "Pflanzenreich," IV, 225.

Hydnoraceae.
Solms-Laubach, Graf H.—Hydnoraceae in "Pflanzenreich," IV, 76.

Leguminosae.
Baker, E. G.—"The African Species of Crotalaria," Journ. Linn Soc. (Bot.), LXII, 1914.
"The South African Species af Rhynchosia" (in the press).
Bolus, L.—"Notes on Lessertia, with Descriptions of Six New Species and a Key," Ann. Bolus Herb., I, 1915.
Dümmer, R. A.—"A Synopsis of the Species of *Lotononis* E. and Z. and *Pleiospora* Harv.," Trans. Roy. Soc. S.A., III, 1913.
Phillips, E. P.—"The genus Calpurnia," Ann. S.A. Mus., IX.
"The genus Borbonia," S.A. Journ. Sc., XVI.

Stephens, E. L.—" A New Species of Haematoxylon from Great Namaqualand," Trans. Roy. Soc. S.A., III, 1913. (This is H. Dinteri Harms).

Phillips, E. P., and Hutchinson, J.—" A Revision of the African Species of Sesbania," Bothalia, I, 1921.

Glover, R.—" South African Species of Acacia," Ann. Bolus Herb., I, 1915.

Loranthaceae.

Sprague, T. A.—" The South African Sections of Loranthus," Kew Bull., 1915.

Lythraceae.

Koehne, E.—Lythraceae in " Pflanzenreich," IV, 17.

Meliaceae.

De Candolle, C.—Meliaceae in " Suites du Prodromus," I, 1878.

Melianthaceae.

Phillips, E. P.—" The genus Bersama," Bothalia, I, 1921.

Schönland, S.—" Notes on the genus Greyia, Hook et Harv.," Rec. of the Alb. Mus., III, 1914.

Menispermaceae.

Diels, L.—Menispermaceae in " Pflanzenreich," IV, 94, 1910.

Passifloraceae.

Hutchinson, J., and Pearce, K.—Revision of the genus *Tryphostemma.*, Kew Bull., 1921, 257.

Portulacaceae.

Berger.—See under " Ficoidaceae."

Proteaceae.

Phillips, E. P.—" Note on the Principal Systematic Work and Publications dealing with the South African Proteaceae," Trans. Roy. Soc. S.A., II, 1912.

" The genus Diastella," Journ. of Botany, Jan., 1911.

Kotze, J. J., and Phillips, E. P.—" A Note on the genus Faurea," S.A. Journ. of Science, XVI, 1919.

Rafflesiaceae.

Solms-Laubach, Graf H.—Rafflesiaceae in " Pflanzenreich," IV, 75.

Rutaceae.

Dümmer, R. A.—" A Contribution to our Knowledge of the genus *Agathosma*," in Fedde's Repertorium, XI, 1912.

" A further contribution of our Knowledge of the genus *Agathosma*, Willd.," Ann. Bolus Herb., 111, 1920.

Verdoorn, I. C.—" The genus Fagara," Journ. of Bot., Aug., 1919.

Santalaceae.

Hill, A. W.—" The genus Thesium in South Africa and Notes on South African Santalaceae," Kew Bull., 1915.

Sapindaceae.

Phillips, E. P.—" The Natal Species of Sapindaceae," Bothalia, I, 1921.

Schlechter, R.—" Die Gattung Pappea E. et Z.," Engl. Bot. Jahrb., L. (Supplement band), 1914.

Baker, E. G.—" The African species of *Allophylus* (incl. *Schmidelia*), Journ. of Bot., 1919.

Tiliaceae.

Sprague, T. A., and Hutchinson, J.—" The Triumfettas of Africa," Journ. Linn. Soc. (Bot.), XXXIX, 1909.

Umbelliferae.

Wolff, O.—Umbelliferae in " Pflanzenreich," IV, 228.

Urticaceae.

Warburg, O.— Die südafrikan. Arten der Gattung *Ficus*. Vierteljahrschr. der naturf. Gesellsch. in Zürich, Jahrg. 51, Heft 1, 144.

Vitaceae.

Gilg, E., and Brandt, M.—" Vitaceae Africanae," Engl. Bot. Jahrb., XLVI.

Zygophyllaceae.

Schönland, S.—" Ueber die Gattung Augea," Engl. Bot. Jahrb.. L. (Supplement band), 1914.

Metachlamydeae (*Sympetalae*).

Asclepiadaceae.

Berger, A.—" Stapelien und verwandte Gattungen. Sukkulente Compositen," Stuttgart, 1910.

Borraginaceae.

Pilger, A.—" Die Gattung Wellstedia in Südwest Afrika," Engl. Bot. Jahrb., XLVI.

Brand, A.—Borraginaceae—Borraginoideae—Cynoglosseae in " Pflanzenreich," IV, 252 (1921).

Campanulaceae.

Phillips, E. P.—" A Revision of the South African Material of the genus Cyphia," Ann. S.A. Mus., IX.

Compositae.

Hutchinson, J.—" Notes on African Compositae," Kew Bull., 1916 (*Schistostephium*, *Brachymeris*, *Marasmodes*, *Stilpnophytum*, *Pentzia*) ; 1917 (*Matricaria* L. and *Chrysanthemun* DC.).

Hutchinson, J., and Phillips, E. P.—" A Revision of the genus Pteronia," Ann. S.A. Mus., IX, 1917.

Moeser, W.—" Die Afrikanischen Arten der Gattung Helichrysum (Adans.)," Engl. Bot. Jahrb., XLIV, 139.

Muschler, R.—" System. und pflanzengeogr. Gliederung der afrik. *Senecio* arten." Engl. Bot. Jahrb., XLIII, 1.

Gentianaceae.

Hill, A. W.—" Notes on Sebaea and Exochaenium," Kew Bull., 1908.

Prain, D.—" Notes on Chironia and Orphium," Kew Bull., 1908.

Myrsinaceae.

Mez, C.—Myrsinaceae in " Pflanzenreich," IV, 236.

Primulines (*Myrsinaceae*, *Primulaceae*, and *Plumbaginaceae*).

Verdoorn, I. C.—" The Transvaal Primulines," S.A. Journ. of Science, XVI.

Verbenaceae.

Pearson, H. H. W.—" South African Verbenaceae," Trans. S.A. Phil. Soc., XV, 1905.

2. PTERIDOPHYTA.

Sim, T. R.—" The Ferns of South Africa," 2nd ed., Cambridge, 1915 ; with 186 plates. This also deals with the fern allies. In the first edition of this work, published in 1892, a pretty full account of the bibliography of South African ferns up to that year is given on pp. 17–25.

3. BRYOPHYTA.

Shaw, J.—" Catalogue of the Mosses of Cape Colony," S.A. Monthly Magazine, 1878.

Sim, T. R.—" Check List of the Bryophyta of South Africa," Maritzburg, 1915. This includes an " historical review " in which the literature is pretty comprehensively dealt with. The work is stylographed, not printed.

Wager, H. A.—" A Check List of the Mosses of South Africa," Pretoria, 1917.

Dixon, H. N.—" New and Interesting South African Mosses," Trans. Roy. Soc. S.A., VIII, 1920.

Warnstorf, C.—Sphagnum in " Pflanzenreich," 1911.

4. THALLOPHYTA.

(a) *Lichens*,

South African lichens have not been specially dealt with in any recent publication. The following should be consulted :—

Massalongo, A. B.—" Lichenes Capenses quos collegit in itinere 1857–58. Dr. Wawra," Venezia, 1864.

Crombie, I. M.—" An Enumeration of the Lichens collected at the Cape of Good Hope by the Rev. A. E. Eaton during the Venus Expedition in 1874," Journ. Linn. Soc. (Bot.), XV.

Stirton, J.—" Additions to the Lichen Flora of South Africa," Trans. Glasgow Soc. of Field Naturalists, Part V, 1877.

Stitzenberger, E.—" Lichenaea Africana," St. Gallen, 1890–91 ; and Supplementa I, II, 1894.

(b) *Fungi* (by Dr. E. M. Doidge).

An excellent list of early references to South African fungi is contained in the " Catalogue of Printed Books and Papers relating to South Africa," Part I, Botany, by P. MacOwan and H. Bolus, published in the Trans. S.A. Phil. Soc., Vol. II, Part III, 1882, pp. 113–187. The bibliography in Dr. Pole Evans' presidential address to Section C of the S.A.A.A.S., 1916, is also valuable. This paper is entitled " A Sketch of the Rise, Growth, and Development of Mycology in South Africa."

Numerous South African species of fungi were described by P. Hennings and G. Winter in " Hedwigia " ; Winter's papers between 1884 and 1897, and Hennings' in the volumes for 1895, 1898, 1900, and 1908. A further paper by Hennings on " African Fungi in the Berlin Museum," appeared in Engler's Botanische Jahrbücher for 1892.

A number of collections of South African fungi were named and described by H. and P. Sydow in the " Annales Mycologici," Vols. VII–XII (1909–14), and Sydow's " Monographia Uredinearum " includes a number of South African species.

Numerous references to South African Ascomycetes may be found in recent papers published in the " Annales Mycologici " and elsewhere by F. Theissen and R. Sydow. The most important of these is entitled " Die Dothideales," in Vol. XIII, Nos. 3–6, 1915. A number of papers, chiefly on the Ascomycetes and Basidiomycetes, have appeared in the Transactions of the Royal Society of South Africa and the South African Journal of Science, since the year 1915, by Dr. Doidge and Dr. Van der Bijl and others, and there are numerous scattered references to South African Basidiomycetes in the mycological writings of C. G. Lloyd, Vols. I–V. Mention should also be made of the new publication " Bothalia," which will include mycological papers.

Descriptions of most of the known South African fungi, with the exception of those recently named, are to be found in Saccardo's " Sylloge Fungorum."

(c) *Algae.*

Fritsch, F. E., and Stephens, E.—" Contributions to Our Knowledge of the Fresh Water Algae of South Africa," Trans. Roy. Soc. S.A., IX, 1921. The first paper of this series was published in the " Annales de Biologie Lacustre," VII, 1914; the second in the " Annals of the South African Museum," IX, 1918. The earlier literature dealing with the fresh water Algae of South Africa is considered in the latter paper.

West, G. S.—" Fresh Water Algae collected by H. H. W. Pearson," Ann. S.A. Mus., IX, 1912.

Braun, A.—" Die Characeen Afrikas," Berlin, 1868.

Grooves, H. and J.—" Characeae from Cape Peninsula," Journ. Linn. Soc. (Bot.), XXXVII, 1906.

Barlow, Miss—" List of South African Marine Algae," Journ. of Bot., 1893.

Delf, E. M., and Michell, M. R.—" The Tyson Collection of Marine Algae," Ann. Bol. Herb., III, 89.

(This includes references to species recorded from South Africa, but not in the collection. On page 119 a list of literature will be found.)

Numerous South African Marine Algae are figured in :—

Kützing, F.—" Tabulae Phycologicae."

Harvey, W. H.—" Nereis Australis," 2 parts, 1847–49.

B.—Economic Botany.

No general account of South African economic botany is available. References to uses of South African plants are scattered in the various South African Agricultural Journals, the "South African Journal of Industries," etc. Some poisonous plants have been investigated by the chemists of the Agricultural Department and a few others. In connection herewith the following will give some information :—

Juritz, C. H.—" The Need for Organized Chemical Research in the Cape Colony." Read before the British Assoc. for the Adv. of Science, Capetown, 1905.

" Some Notes regarding S.A. Pharmaeology," Trans. S.A. Phil. Soc., XVI, 1905.

" The Urgency of a Definite Forward Movement in the Study of the Active Principles of S.A. Plants," Capetown, 1915.

Marloth, R.—" The Chemistry of South African Plants and Plant Products " (with bibliography), Capetown, 1913.

Reports of the Director of Veterinary Research, Onderstepoort.

(a) *Raw Products for Industrial Purposes.*

" Notes on Some South African Raw Materials," S.A. Journ. of Industries, IV, 1921, 359–71.

(b) *Medicinal Plants.*

Pappe, C. W. L.—" Florae Capensis Medicae Prodromus," 3rd ed., 1868.

Smith, A.—" A Contribution to South African Materia Medica," 2nd ed., Lovedale, 1888.

Bryant, A. T.—" Zulu Medicines," in Ann. Natal Museum, II, 1909.

Gunn, J. W. C.—" The Action of Urginea Burkei," Trans. Roy. Soc. S.A., IX, 1921.

(c) *Stock Food Plants.*

Pole Evans, I. B.—" The Veld : Its Resources and Dangers," S.A. Journ. of Science, Nov., 1920.

MacOwan, P.—" Colonial Stock Food Plants," Cape Monthly Magazine, XV, 1877.

Bews, J. W.—" The Grasses and Grasslands of South Africa," Pietermaritzburg, 1918.

There are also references to this section in Marloth, " Das Kapland and the Flora of South Africa," and in various South African Agricultural Journals.

(d) *Weeds.*

Burtt-Davy, J.—" Alien Plants Spontaneous in the Transvaal," Report S.A.A.A.S., 1904.

Salisbury, F. S.—" List of Grahamstown Weeds," Agric. Journ. of the Union of South Africa, VI, VII.

" Naturalized Plants of Albany and Bathurst," Rec. Alb. Mus., III, 1919.

Lansdell, K. A.—" The Weeds of South Africa," Union Agric. Journ., 1921.

(e) *Forest Plants.*

Pappe, C. W. L.—" Silva Capensis," 2nd ed., London and Capetown, 1862.

Sim, T. R.—" The Forests and Forest Flora of the Colony of the Cape of Good Hope," Aberdeen, 1907.

" Native Timbers of South Africa," Pretoria, 1921.

C.—PLANT PATHOLOGY (by Dr. E. M. Doidge).

Literature on South African plant pathology is comparatively scanty. A large number of papers of a popular character have been published; these may be found in the Journal and Bulletins of the Department of Agriculture, and in such publications as " The South African Fruit Grower," " The Agricultural Journal of South Africa," and the Farmers' Supplement to the " Sunday Times." Papers of a more technical nature are few in number, the more important being included in the following list:—

Bottomley, A. M.—" A Disease of Young Pepper Trees (*Gloeosporium* sp.)," Agric. Journ. of South Africa, I, No. 4, 371–373, 1915.

Doidge, E. M.—" A Bacterial Disease of the Mango (*Bacillus mangiferae*, n. sp.)," Ann. of Applied Biology, II, 1–45, pls. 1–14, 1915.

" The South African Mulberry Blight," Ann. of Applied Biology, II, 113–124, pls. 19–24, 1915.

" On the Occurrence of *Bacterium Campestre* in South Africa," South African Journ. Sci., XI, 401–409, pls. 8–11 and 4 text figs., 1916.

" A Bacterial Blight of Pear Blossoms occurring in South Africa," Ann. of Applied Biology, IV, 50–74, with 7 text figs., 1917.

" A Bacterial Spot of Citrus," Ann. of Applied Biology, III, pls. 53–80, 3–13, 1917.

" The Origin and Cause of Citrus Canker in South Africa, "Union Dept. Agric., Sci. Bull. 8, 1916.

" The Rôle of Bacteria in Plant Diseases," South African Journ. Sci., XVI, 65–92, 1919.

" The Bacterial Blight of Beans (*Bacterium phaseoli*)," South African Journ. Sci., XV, 503–505, 1919.

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D.—SOUTH AFRICAN PHYTOGEOGRAPHY.

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E.—ECOLOGY OF SOUTH AFRICAN PLANTS.

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" The Plant Ecology of the Drakensberg Range," Ann. Natal Museum, III, 1917.

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F.—FOSSIL PLANTS.

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CHAPTER VIII.

HINTS ON THE PHOTOGRAPHING OF PLANTS.

By R. Marloth, Ph.D.

There is no need here to emphasize and to discuss the usefulness, or rather the indispensability, of the photographic camera in the botanical exploration of the country. If it were possible, one ought to take a photograph of the habitat of every more important plant collected, but as that cannot be done, it is advisable at any rate to secure photographs of typical localities in a given area and of typical or dominating plants therein. But if such photographs are to be of real value, they must show the specific character of the locality or the specific object clearly and distinctly. To do this successfully is, however, not such a simple matter as the man who snaps a picnic party in the Bushveld or the bathers on Muizenberg beach may imagine.

Photography covers a wide field, and every branch of it has its own specific requirements and difficulties which demand special study in order to be overcome. This is also the case with our branch of the work, and a few hints based on a fairly long practice may be helpful in shortening the road to success for the beginner in this kind of work.

It is assumed that the reader is familiar with the ordinary technique of outdoor photography; that he also knows the special qualities of orthochromatic plates and the use of the yellow screen, and that he is able to develop his plates to the best advantage according to the nature of the subject. If he does not possess this knowledge, he should study the chapters dealing with these matters in some of the handbooks of photography. It is also assumed that he keeps a careful record of all details concerning every view taken, not only of those of botanical interest, but particularly also of all points bearing upon the technical side of the photograph, viz. speed and nature of plate, lens and stop employed, nature of light, time of day, exposure, developer, duration of development, etc., for by doing so the worker will learn to avoid causes of failure and gradually improve his results.

Let us group the few points of advice offered here as follows: Camera and outfit; choice of subject and exposure; development and after-treatment.

(1) *Camera and Outfit.*—If the worker cannot afford more than one camera, he should choose a half-plate instrument with a fairly long extension. An instantaneous shutter is not absolutely necessary—we have worked for many years without one. But one should have at least two lenses, viz. a wide angle, short focus lens, and a landscape lens with a longer focus. Of course, a combination lens with different front and back lenses will be still better, for that would give him three different focal lengths. The wide angle lens is specially useful in close scenery where it is desirable to give special prominence to one subject, e.g. a shrub in the foreground; while a view where the distance is an important feature will require the long focus lens. Of specially important plants one ought to secure both kinds of view.

For travelling it will be found very convenient to have a hand-camera as well, especially if the worker can afford a reflex camera of post card size with adjustable lens.

(2) *Plates.*—For most objects it is preferable to use orthochromatic plates specially sensitive to green and yellow in combination with a yellow screen of moderate intensity. A screen lengthening the exposure four to five times is generally sufficient. When taking views at sunset or sunrise, a favourite time of ours, the screen may be omitted, but on account of the yellowish light the exposure has to be calculated as if the screen were in position. For objects with fine lines standing out against a darker background, say climbers at the edge of a forest, or dark objects standing out against a light background, say fine twigs or tall grasses against the clear sky, it is essential to use anti-halation plates (backed plates or films will do instead), otherwise the outline of the bright objects will be blurred.

(3) *Exposure.*—Our practice is to work against the light if it can be had coming in slanting from the front. For the protection of the lens against direct illumination from the sun we employ a black cardboard cuff fitting over the front of the lens Exposure to be given, of course, for the shadows. A mellow light, say a sun veiled by thin clouds which just leave the sun visible, will always give better results than full sunlight, which generally means harsh shadows. Fine foliage, e.g. ericoid leaves, cannot be brought out in direct sunlight, as the shadows confuse the image. In the same way great contrasts in a subject, say white arums with their dark green foliage, can be overcome only in a mild light, that means, if more than the mere outline is aimed at, if, e.g., in the case of arums, the spathes are to appear cup-shaped and the leaves to show their venation, while a sedge in the group is to be recognizable as such. (For illustrations of these points, see "Flora of South Africa," Vol. IV, plate 14, and "Das Kapland," plate 3.) How superior a mild illumination or even a dim light is for very contrasty subjects can best be illustrated by reference to some published photographs. Plate 11 of Vol I of "The Flora of South Africa" shows a group of tree-ferns (*Hemitelia*) at the edge of a forest in Orangekloof on the south side of Table Mountain. I knew that group for many years, but could not attempt to photograph it, as the ground in front was covered by a dense mass of brambles some 4 ft. high, and there was consequently no room for the camera to stand. At last a friend of mine offered to help me in clearing the brambles away, and armed with slashers we did the job in a couple of hours. On that occasion I endeavoured to take the view with the sunlight filtering through the trees behind the ferns, but although I went in my exposure up to thirty seconds and consequently over-exposed some of the fronds, the black trunks of the ferns and the interior of the forest gave me only clear glass on the negative. It was on the third occasion that I succeeded by choosing the time when the sun just disappeared behind the mountain to the left of the group, giving twenty seconds exposure on a plate of the speed of Ilford ordinary. The result shows not only the beautiful delicate foliage of the ferns and brambles, but also the details of the black trunks underneath the fronds. Another illustration of the same principle is afforded by plate 19 of Vol. IV of "The Flora," representing the palmiet (*Prionium serratum*). This photograph was taken half an hour after sunset in the dim light coming from the western sky. Exposure thirty seconds without yellow screen. I should have liked to give at least a couple of minutes, but I did not dare to do so, as I feared that the man standing between the plants might move. Knowing that the plate was much under-exposed, I resorted to stand development

by Rodinal (1 in 200), and found that sufficient detail had been brought out in six hours. The fixed plate was then intensified, and gave a print in which not only the foliage, but also the coal black stems show all details of structure. Where, however, detail is not essential, and the object to be photographed is big enough, full sunlight will often give quite satisfactory results, if other conditions are favourable, as demonstrated by the photograph of *Aloe dichotoma* (Vol. IV, plate 25), taken in the desert near Tsaukaib in the Namib, in the blazing midday sun of a November day, the glare from the sand being so strong that it was painful to the eyes. In such cases photographing against the light is essential, and for that method backed plates (anti-halation) are indispensable.

The reader will have noticed that we generally use plates and not films. The reason is the greater safety and ease which plates afford during the development as well as in all subsequent manipulations, and this brings us to an important feature of the work which is not generally recognized.

Many photographers still think that all negatives are finished when fixed, washed, and dried. Our experience is that every two out of three, even of skilful workers, are capable of improvement by treating them in one way or another afterwards, barring, of course, retouching on the film. Reduction either by Farmer's fluid for a general removal of fog, etc., or uneven reduction for the softening of too strong contrasts by ammonium persulphate often helps a good deal. More generally intensification turns a flat negative into a fair one, and quite as often partial reduction of an over-dense spot or partial shading of a very thin portion by means of a coating of matt varnish on the glass side will remove some unpleasant feature such as black shadows or glaring high lights, etc., in the view. Examples for the successful removal of these two faults are shown on the photograph of *Protea cynaroides* in Vol. I, plate 35, and that of arums in Vol. IV, plate 14. In the former the buds of the protea were so dense owing to over-exposure enforced by the dark foliage around them that an ordinary print showed no details of the bracts, but merely the outline of the capitulum. After rubbing the buds carefully down with alcohol all the bracts were brought out properly. In the other photograph stands the charred trunk of an oak which formed a dead black patch in the midst of the picture. By covering the glass side with matt varnish and giving the varnish a little additional shading the black interior of the trunk showed its structure in the photograph.

There is one difficulty in photographing flowers about which we have been consulted fairly often, viz. how to obtain good photographs of red flowers when growing in their native haunts. We willingly admit that we have had a good many failures ourselves, and that even with some much-praised red-sensitive or some so-called panchromatic plates (which have to be handled in absolute darkness) the results were not better until experience had taught us how to achieve success. We now use ordinary orthochromatic plates and a deep yellow screen (8x), choosing for the camera such a position that the light (not full sunlight) comes slanting from the front, thus making the flower itself a source of transmitted and not only of reflected light. Plate 60 and fig. 61 of Vol. IV show such flowers, viz. *Disa uniflora* and *Rochea coccinea*, giving all details of structure.

We fear that some of our readers will be disappointed with the advice we have been able to give in these few pages, for it does not show them any short cut to success. Well, our experience is that painstaking study and unlimited patience are indispensable to the nature-photographer who aims at high things. One more quotation from "The Flora of South Africa" will illustrate this point. The bird on the protea (Vol. I, pl. 20) was secured during our fourth visit to that spot, and then only after we had waited for four hours standing behind the camera, bulb of shutter in hand. On each of the other days we had waited even longer, but in vain, for the bird came and went and came again, visiting the other flowers of the shrub where he was only partially visible, but never going on to the open one where we wanted him.